

# **Integrated Water Quality Monitoring and Assessment Methods**

This report was prepared pursuant to Sections 303(d) of the Federal Clean Water  
Act

State of New Jersey  
Department of Environmental Protection  
Water Monitoring management  
Water Assessment Team

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# Integrated Water Quality Monitoring and Assessment Methods

## Table of Contents

SECTION	PAGE
1. Introduction	1
2. Statutory Authority and Guidance	3
3. General Data Requirements	5
4. Assessment Methods for Numeric Water Quality Criteria	8
4.1 Conventional Water Quality Parameters Assessment	9
4.2 Toxic Water Quality Parameters Assessment	12
5. Assessment Method for Designated Use Attainment	16
5.1 Aquatic Life Designated Use Assessment	16
5.2 Recreational Designated Use Assessment	21
5.3 Lake Aesthetic Quality Assessment	23
5.4 Fish Consumption Designated Use Assessment	26
5.5 Shellfish Harvesting Designated Use Assessment	27
5.6 Drinking Water Supply Designated Use Assessment	28
5.7 Industrial Water Supply Designated Use Assessment	29
5.8 Agricultural Water Supply Designated Use Assessment	30
6. Spatial Extent of Assessment	32
7. Integrated Listing Method	40
8. Method to Rank and Prioritize Impaired Waterbodies (Sublist 5)	44
9. Monitoring and Assessment Plan Development	46
10. Public Participation	49
11. References and Additional Information	51
APPENDICES	54
I. 2002 Integrated Water Quality Monitoring and Assessment Report Guidance	
II. Data Sources for the 2002 New Jersey Integrated Report	
III. Nutrient Criteria Plan (PLACEHOLDER)	
IV. USEPA–USGS–NJDEP Interagency Workgroup Assessment and Listing Methodology for Aquatic Life in Freshwater Streams	
V. Integrated Water Quality Monitoring and Assessment Method for Metals (2002)	
VI. List of Acronyms and Abbreviations	

## **List of Tables**

Table 4.1	Data Requirements Specific to Conventional Water Quality Parameters
Table 4.2	Conventional Water Quality Parameters Assessment Method
Table 4.3	Unionized Ammonia Assessment Method
Table 4.4	Data Requirements for the Assessment of Metals
Table 4.5	Metals Assessment Method
Table 5.1	Data Requirements Specific to Aquatic Life Designated Use Assessments for Lakes
Table 5.2	Aquatic Life Designated Use Assessment Method for Lakes
Table 5.3	Macroinvertebrate Assessment Method
Table 5.4	Sampling Characteristics for Assessment of Aquatic Life Designated Use for Tidal Waters
Table 5.5	Aquatic Life Designated Use Assessment Method for Tidal Waters
Table 5.6	Data requirements for Assessment of Recreational Designated Use
Table 5.7	Recreational Designated Use Assessment Method
Table 5.8	Recreational Use Support Assessment Methodology for Eutrophic Lakes
Table 5.9	Data Requirements for Assessment of Lake Aesthetic Quality.
Table 5.9	Lake Aesthetic Quality Assessment Method
Table 5.10	Lake Target Levels for Selected Parameters as per USEPA's Clean Lakes Program Guidance Manual.
Table 5.11	Fish Consumption Designated Use Assessment Method
Table 5.12	Data Requirements for Assessment of Shellfish Harvesting Designated Use
Table 5.13	Shellfish Harvesting Designated Use Assessment Method
Table 5.14	Drinking Water Designated Use Assessment Method
Table 5.15	Industrial Water Supply Designated Use Assessment Method
Table 5.16	Agricultural Designated Use Assessment Method
Table 7.1	Integrated Listing Method
Table 9.1	Monitoring and Assessment Plan Method

## **List of Figures**

Figure 1.	USEPA Region II Helicopter Monitoring
Figure 2.	Spatial extent is the entire bay with a "Full Attainment" result
Figure 3.	Clusters of sampling sites have different assessments. Bay divided into two spatial extents
Figure 4.	Strahler Stream Order
Figure 5.	Spatial extent of a monitoring site (land use indicator in dominant land use) located on a 4 <sup>th</sup> order stream
Figure 6.	Spatial extent of a monitoring site (statewide status in mixed land use) located on a 4 <sup>th</sup> order stream
Figure 7	Example of estimated river reach based on biological monitoring sites. Large, dark lines represent estimated river reaches.

## 1. Introduction

The US Environmental Protection Agency (USEPA) issued guidance (USEPA 2000) for the development of an Integrated Water Quality Monitoring and Assessment Report (Integrated Report) by the States beginning with the Year 2002 submittal. This guidance recommends for the first time that States integrate their Water Quality Inventory Report (Section 305b of the Clean Water Act) with their Impaired Waterbodies List (Section 303d). The Integrated Report is intended to provide an effective tool for maintaining high quality waters and improving the quality of waters that do not attain water quality standards. The Integrated Report also provides water resources managers and citizens with detailed information regarding the following:

- Delineation of water quality assessment units providing geographic display of assessment results;
- Progress toward achieving comprehensive assessment of all waters;
- Water quality standards attainment status;
- Methods used to assess water quality standards attainment status;
- Additional monitoring needs and schedules;
- Pollutants and watersheds requiring Total Maximum Daily Loads (TMDLs);
- Management strategies (including TMDLs) under development to attain water quality standards;
- TMDL development schedules.

The New Jersey Department of Environmental Protection (NJDEP) elected to develop an Integrated Report for New Jersey since this approach offers several significant improvements over the traditionally separate Water Quality Inventory and Impaired Waterbodies List Reports. Through the Integrated Report, EPA and NJDEP will begin to implement recommendations regarding comprehensive monitoring strategies included in the National Research Council's Report "*Assessing the TMDL Approach to Water Quality Management*" (National Research Council, 2001). This report emphasized the importance of science-based decision-making in both monitoring and assessment for developing an effective water quality management program.

The Integrated Report improves water quality reporting by providing detailed descriptions of data sources and assessment methods as a basis for sound, technical assessment decisions. In addition, assessment results are represented in a spatial context, presenting a clearer picture of water quality. Monitoring needs and schedules are described, facilitating the articulation of monitoring priorities and identifying opportunities for cooperation with other agencies and watershed partners. TMDL needs and schedules are defined to convey plans for water quality improvements. Finally, the public participation aspects provide opportunities for data submittal and open discussion of water quality assessment methods and results.

However, these changes also bring new challenges. An example of a major shortcomings: under USEPA guidance (USEPA, 2001), a waterbody can be included in only one of the 5 sublists (i.e., the sublist that conveys the highest degree of impairment) as a result of the integrated assessment. Thus, if a waterbody meets all applicable surface water quality standards except fecal coliform, the waterbody would be included only in Sublist 5 - "*Water quality standard is not attained and a TMDL is required*" - until the fecal coliform TMDL is completed, even though all other water quality standards are met. Since this approach may result in an overly negative view of water quality, the Department has chosen to develop the Integrated List by waterbody/parameter, not just by waterbody. This will enable the Department to present each parameter for each waterbody in the appropriate sublists.

The Integrated Report combines the non-regulatory requirements of the Water Quality Inventory Report (305b) with the regulation-based List of Impaired Waterbodies (303d), mandates TMDL development. The success of integrating the previous reports into a single report requires an awareness of requirements and procedures. In particular, Sublist 5 of the Integrated Report represents USEPA reporting requirements under Section 303d (Impaired Waterbodies), and the remaining sublists represent assessment under Section 305b (Water Quality Inventory). The regulatory requirements (i.e., EPA approval and adoption; public participation, etc.) for 303d impaired waterbodies listing, therefore, only applies to Sublist 5 of the Integrated Report.

The methods used to develop the 2002 Integrated Report (and subsequent Reports) are described in this document (Methods Document). The goal of the Methods Document is to provide an objective and scientifically sound waterbody assessment methodology including:

- A description of the data that NJDEP will use to assess attainment of surface water quality standards;
- The quality assurance aspects of the data;
- A detailed description of the methods used to evaluate water quality standards attainment;
- The placement of waterbodies in one of 5 Sublists.

The Methods Document provides a companion to the 2002 Integrated Report. It is anticipated that this is an evolving document that will be modified, as appropriate, to accompany subsequent Integrated Reports.

## **2.0 Statutory Authority and Guidance**

The rules, regulations, and guidance that are relevant for the development of the Integrated Report are briefly discussed below.

**2.1 The Federal Water Pollution Control Act** and its subsequent amendments are collectively known as the Clean Water Act (CWA). The CWA provides the statutory requirements for numerous water programs including Surface Water Quality Standards, Water Quality Inventory Report, Impaired Waterbodies List, and Total Maximum Daily Loads (TMDLs).

**2.2 Surface Water Quality Standards (SWQS)** include water quality goals, policies, numeric and narrative criteria, and applicable design flows and waterbody classifications. Federal SWQS are promulgated by the USEPA. As required, New Jersey has adopted SWQS that are at least as stringent as the federal standards. New Jersey SWQS adopted at N.J.A.C. 7:9B in 1998 have received all USEPA approvals and were used to assess attainment of SWQS. Revisions to the NJ SWQS adopted in 2002 are undergoing final EPA review and will be used for subsequent Integrated Reports. The numerical criteria for some toxic parameters are found in USEPA's National Toxics Rule (CFR, 1989). The Delaware River Basin Commission (DRBC) adopted standards for the Delaware River, estuary and tributaries to the head of tide (DRBC, 1996). The New Jersey Department of Health and Senior Services (NJDHSS) establishes sanitary quality standards and beach closure procedures for ocean bay and lake bathing beaches (NJDHSS, 2000). The terms "applicable SWQS" and "applicable criteria" refer to the legally binding SWQS and criteria for the waterbody depending on jurisdiction and waterbody classification.

**2.3 Water Quality Inventory Reports (305b)** are prepared every two years by States and EPA as required under Section 305b of the CWA and contain assessments of water quality and descriptions of water resources management programs. These reports are used by Congress and USEPA to establish program priorities and funding for federal and state water resources management programs. EPA issues guidance as needed regarding the preparation of water quality inventory reports.

**2.4 Impaired Waterbodies Lists (303d)** are required under Section 303(d) of the CWA, and implementing federal regulations at 40 CFR 130.7. New Jersey regulations regarding Impaired Waterbodies Lists are found at N.J.A.C. 7:15-6. These regulations require identification of impaired waterbodies: those waters for which required pollution controls were not stringent enough to achieve the state's surface water quality standards. The state is required to establish TMDLs for the impaired waterbodies based on a priority ranking. Impaired Waterbodies Lists are required every two years and must be based on a documented methodology that includes an evaluation of existing and readily available data. Waterbodies continue to be included on subsequent Impaired Waterbodies Lists until: 1.) TMDLs are completed; 2.) Applicable criteria are met; or 3.) The original basis for the listing is shown to be flawed (See Section 7.3). Public participation in the development of Impaired Waterbodies Lists is required (See Section 10). USEPA is required to review and approve each state's 303(d) List (Sublist 5 in this Methods Document). In New Jersey, the final 303d List (Sublist 5) is adopted through the States Water Quality Management Plan as required in N.J.A.C. 7:15-6. (See Section 10).

A TMDL establishes allowable point and nonpoint source pollutant loads that a stream can assimilate and meet the applicable surface water quality standards criteria. TMDL implementation may result in more stringent discharge permit limits and/or non-point source best management practices (BMPs).

**2.5 Integrated Report Guidance** USEPA provided guidance to the States for developing Integrated Reports (USEPA 2001). The complete 2002 Integrated Report guidance is included in Appendix 1 and an overview of how NJDEP assesses waters based on this approach is described in Section 7 (Integrated Listing Guidance Methods). USEPA emphasized that the Integrated Report guidance does not alter the statutory provisions in sections 305b and 303d of the Federal Clean Water Act, nor does it change existing rules governing development of Impaired Waterbodies Lists discussed above. However, the guidance does update previous guidance, and supercedes previous guidance. USEPA recommends the use of five sublists to convey water quality standards attainment status.

The Integrated Report Guidance emphasizes the importance of monitoring and assessing waterbodies in each sublist to; obtain the information needed, assess progress toward attainment of SWQS, address data gaps, and ensure that waterbodies which currently meet SWQS continue to do so.

### 3.0 General Data Requirements for the Integrated Report

**3.1 Data Sources:** NJDEP reviewed all existing and readily available data as required and is committed to using only data with acceptable quality assurance to develop the Integrated Report. Additional information on data sources is provided in Appendix 2: *Data Sources for the 2002 Integrated Report*.

**3.2 Quality Assurance:** NJDEP maintains a strong commitment to the collection and use of high quality data to support environmental decisions and regulatory programs. Quality Assurance Project Plans (QAPP) describe the procedures used to collect and analyze samples in order to certify high quality data. The Department maintains a policy that an approved Quality Assurance Project Plan (QAPP) accompany all environmental data collection activities performed by, or for use by, the Department as outlined in the Department and USEPA Region 2's approved FY01-FY02 Departmental Quality Management Plan (NJDEP, 2001). NJDEP also published a Field Sampling Manual that includes approved procedures for sample collection, field quality assurance, sample holding times, and other data considerations (NJDEP, 1992). Use of this manual, or equivalent field procedures, is required. Samples must be analyzed at a laboratory certified by NJDEP's Office of Quality Assurance, or federal laboratory (e.g., USGS National Water Quality Laboratory in Denver). The laboratory must use analytical methods certified by NJDEP, (N.J.A.C. 7:18), USEPA, or USGS.

The QAPPs for all routine ambient monitoring programs operated by NJDEP are approved annually prior to initiation of sampling. QAPPs are prepared and approved prior to initiating research projects. The Interagency Toxics in Biota Committee (TIBC) reviews data and risk assessment methods used to develop fish consumption advisories. The Site Remediation Program (SRP) requires very extensive quality assurance documentation and QAPPs, which must be approved by NJDEP or USEPA, as required. NJDHSS oversees quality assurance procedures for the monitoring programs conducted by local health authorities (e.g., Lake Beach Monitoring).

All data and information submitted to NJDEP for consideration in the development of the Integrated Assessment is required to follow the Department's quality assurance guidelines (NJDEP, 2001).

**3.3 Locational Data:** Accurate locational data are particularly important for the Integrated Report since each sampling station assessment is linked to a waterbody. For some parameters (e.g., dissolved oxygen, temperature, and pH), the applicable SWQS criterion depends on specific stream classification areas established by regulation (N.J.A.C.7:9B). Sampling stations must be outside of the mixing zone and zone of initial dilution. Accurate locational data is required to ensure appropriate comparisons to SWQS criteria, as well as confirming that sampling stations are located outside of regulatory mixing zones. NJDEP will accept monitoring data if sampling locations are accurate to within 200 feet. Digital spatial data (GIS or GPS) and USGS Quadrangle maps are acceptable methods of providing locational information. Only sampling data that are spatially referenced will be used to develop the Integrated Report. Location data for all NJDEP monitoring stations are recorded utilizing a Global Positioning System.

Locational data are referenced to estimate the spatial extent of sampling station assessments using the methods discussed in Section 6. Previous EPA guidance for Water Quality Inventory Reports included two types of spatial assessments: monitored waters and estimated waters, which are defined for this Integrated Report Methodology as follows:



- **Monitored Waters:** assessment results applied to a waterbody based on monitoring site data using the hydrologic method for estimating spatial extent (discussed in Section 6). Given the high degree of confidence in these results for monitored waters, they will be used to place a waterbody in Sublists 1 through 5.
- **Estimated Waters:** assessment results extrapolated from adjacent monitored waters using the hydrologic method for estimating spatial extent (discussed in Section 6). Extrapolations will be based on land use, possible pollution sources, and best professional judgement. Given the lower degree of confidence in these results for estimated waters, they will only be used to place a waterbody in Sublist 3.

**3.4 Pollutant versus Pollution–** Pollutant is defined in Section 502(6) of the Clean Water Act (CWA) as “spoil, solid waste, incinerator residue, sewerage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water”. Pollution is defined as “the man-made or man-induced alteration of the chemical, physical, and radiological integrity of a waterbody”. The definition of “pollutant” in the CWA includes a number of listed materials and categories of materials. The alteration of water flow and aquatic habitat are not among the items specifically identified as a pollutant, and also does not correspond with any of the general categories of pollutants, such as industrial and agricultural wastes. In addition, USEPA, in its comments on Idaho’s 303(d) list, agrees that the alteration of flow and habitat are not pollutants. Therefore, New Jersey will not identify these as pollutants or list waterbodies that are impaired solely to as a result of flow or habitat alteration. Although flow and habitat alterations may not be appropriate for TMDL calculations, they are still important factors effecting water quality and should be addressed appropriately under other water quality programs.

**3.5 Electronic Data Management:** In general, only electronic data are considered “readily available”, due to the significant effort needed to computerize and analyze hard copy data. NJDEP uses electronic data from USEPA’s Storage and Retrieval (STORET) system; USGS’s National Water Information System (NWIS), and other special programs (e.g. USEPA’s Helicopter Beach Monitoring Program and local monitoring entities. Typically, NJDEP uses Microsoft databases (i.e., Excel, Access) for database management and retrieval, however, STORET formatting is encouraged as a standard for data management.

**3.6 Reference Reports** In order to establish a strong technical foundation for the Integrated Report, NJDEP requests “citeable” hard-copy reference reports for each data source. This request ensures that the monitoring entities are responsible for compiling the data, completing a detailed quality assurance review, and can address questions regarding the dataset. Furthermore, citeable reports offer those who review the New Jersey Integrated Report an opportunity for independent evaluation of the underlying data. Written reports are available for most datasets and range from very basic raw data reports (that included a brief description of the monitoring program and tables of raw data) to very thorough peer-reviewed reports. Report availability is discussed in more detail in Appendix 2: Data Sources for the 2002 New Jersey Integrated Report.

**3.7 Assessment of Waterbodies on Previous NJ Impaired Waterbodies List** Waterbodies included on the previous NJ impaired waterbodies list, 1998 303(d) List, are evaluated using all

existing and readily available data that meets the data requirements specified in this Methods Document. If new data are available, the waterbody is reassessed using the methods described in Section 4 and 5. If no new data are available and the integrated assessment methods does not justify moving it to an alternate sublist, the waterbody previously listed as impaired, will continue to be assessed as “non-attainment” as required by 40 CFR 130.7 and N.J.A.C. 7:15-6.

#### 4.0 Numeric Water Quality Criteria Assessment

Numeric water quality criteria are available for conventional parameters (i.e. dissolved oxygen, pH, temperature), toxics (i.e. metals, organics, unionized ammonia) and sanitary quality (i.e., pathogens). Water quality data is compared to applicable numerical criteria and may be assessed alone or in combination to determine designated use attainment (e.g., pH and TSS data are integrated to evaluate industrial water supply designated uses).

**Surface Water Quality Standards Considerations:** The following aspects of the applicable numeric water quality criteria (N.J.A.C 7:9B, USEPA's National Toxics Rule and DRBC Water Quality Regulations) are considered in each assessment:

- **Design Flows:** Data must be collected when streams are at or above “design flows” in the applicable SWQS. Design flows in NJ SWQS are defined in N.J.A.C. 7:9B-1.5 and also apply to EPA's National Toxics Rule as follows:
  - a) human carcinogenic effect based criteria: long term harmonic mean flow (i.e., number of daily flow measurements divided by the sum of the reciprocal of the flows);
  - b) non-carcinogenic effect based criteria: minimum average 30 consecutive day flow with a statistical recurrence interval of 5 years (MA30CD5);
  - c) acute aquatic life protection criteria: minimum average 1 day flow with a statistical recurrence interval of 10 years (MA1CD10); and
  - d) chronic aquatic life protection criteria and all other criteria: minimum average 7-day flow with a statistical recurrence interval of 10 years (MA7CD10).

The numerical stream water quality objectives for the Delaware Basin are based on MA7CD10 for streams where stream flow is not regulated. For streams where flow is regulated and the flows are significantly different from natural flows, the design flow may be altered to reflect these variations. (DRBC, 1996, pg. 92).

- **Antidegradation:** The SWQS antidegradation policies for C1 waters preclude changes in water quality except toward natural water quality.
- **Frequency of Exceedence:** The acceptable frequency of exceedence of applicable SWQS for conventional water quality parameters is 10% based on USEPA Guidance for the Preparation of Water Quality Inventory Reports (USEPA, 1997b). For toxics, the allowable frequency of exceedence is 1 in 3 years.
- **Magnitude of Exceedence:** The SWQS and EPA guidance do not provide methods to consider the magnitude of the exceedence. Therefore, the magnitude of an exceedence is not considered, providing a more conservative assessment.
- **Duration of Exceedence:** The SWQS include duration considerations for average concentrations over 1 hour for acute aquatic life criteria, 4 days for chronic aquatic life, 30 days for non-carcinogens and 70 years for carcinogens. In general, based on the current monitoring protocols (i.e., grab samples) it is not possible to consider the duration of exceedence. Therefore, individual exceedences were considered to extend over the applicable duration, providing a more conservative assessment.
- **Natural Conditions:** Waterbodies that do not meet applicable SWQS criteria potentially due to natural conditions will be carefully evaluated. If the excursions can not be conclusively attributed to natural conditions, the waterbody will be classified as “non-attainment” providing a conservative analysis. If excursions can be attributed to natural conditions, the natural water quality will be used in place of the criteria, and the elevated levels will not be considered exceedences of the applicable criteria, as per N.J.A.C. 7:9B-1.5. These waterbodies may be candidates for development of site-specific criteria.

- **Threatened Waters:** Threatened waters are evaluated using EPA Guidance “If water quality now meets applicable water quality criteria but adverse water quality trends indicate that water quality criteria will not be met in 2 years, the waterbody is assessed as threatened and classified as non-attainment” based on guidance for the Integrated Report (USEPA, 2001).
- **Censored Data:** Censored data is data with concentrations that are less than the minimum reporting level of an analytical procedure. These data are usually labeled with a “<” symbol followed by the reporting limit in the data report received from the laboratory. For example, total phosphorus below the minimum reporting level would be “<0.01 mg/l”. These values are set to one-half of the reporting limit for assessments, so that for the above example, 0.005 mg/l would be used in the assessment of total phosphorus.

#### 4.1 Conventional Water Quality Parameters Assessment

Conventional water quality include parameters such as dissolved oxygen, pH, total phosphorus, total suspended solids, total dissolved solids, sulfate, temperature, chloride, and nitrate. Information regarding data sources is provided in Appendix II.

##### 4.1.1 Data Requirements Specific for Conventional Parameters

In addition to the requirements provided in Section 3 (General Data Requirements), the data requirements for analysis of conventional water quality parameters (see table 4.1) are based upon sampling frequency, duration, and data age. The recommended sampling frequency is at least 10 samples collected at least quarterly for a minimum of 2 years. If data collection does not meet these preferred requirements, then a modified assessment method may be applied to more limited data sets with a minimum data requirement of at least 4. These data requirements are intended to ensure that existing water quality conditions are accurately portrayed and do not characterize transitional conditions or use obsolete data.

**Table 4.1: Data Requirements Specific to Conventional Water Quality Parameters**

<b>Data Considerations</b>	<b>Data Requirements Specific to Conventional Water Quality Parameters</b>
Minimum Number of Samples	At least 10 samples. Fewer than ten samples (but not less than 4) may be considered on a case-by-case basis. See Modified Water Quality Assessment under 4.1.2.
Minimum Sampling Frequency	Data collected quarterly, over a 2 year period. Other frequencies may be considered on a case-by-case basis. See Modified Water Quality Assessment under 4.1.2
Data Age	Most recent 5 years of readily available data. Data more than 5 years old may be used on a case-by-case basis. (for example, older data could be used if conditions in the water body have not changed, or if the older data are used in conjunction with newer data to demonstrate water quality trends where appropriate analytical methods are used and results can easily be compared with more recent data.)
Spatial Extent of Assessment	Determined for each site using the spatial assessment method described in Section 6.

#### 4.1.2 Conventional Water Quality Parameters Assessment Method

**Nutrients:** The applicable numerical water quality criterion for total phosphorus in Category 2 streams is 0.1 mg/l or part per million (ppm) total phosphorous (TP); the applicable criterion for lakes is 0.05 ppm TP. In the past, NJDEP has assessed streams at lake inlets and outlets using 0.05 ppm TP to evaluate whether streams could contribute to lake eutrophication and to infer in-lake concentrations in the absence of monitoring data from the lake. For this Integrated Report, all streams are assessed using 0.1 ppm TP except for sampling stations directly at lake inlets which use the lake criterion of 0.05 ppm TP.

In addition to the numerical water quality criteria for total phosphorus, the SWQS include narrative nutrient policies at N.J.A.C. 7:9B-1.5(g) that apply to all freshwaters of the state. The narrative nutrient policies preclude nutrient concentrations that cause objectionable algal densities, nuisance aquatic vegetation or render waters unsuitable for designated uses.

It is anticipated, based on federal guidance (USEPA 1999), that differing eutrophication indicators will be needed to assess attainability of site-specific (i.e., lakes, reservoirs, streams, rivers) designated uses (i.e., aquatic life, recreation and water supply). For example, because of spatial and residence time concerns, NJDEP may need to monitor the following parameters for assessing the designated use attainment of aquatic life protection in a reservoir: dissolved oxygen, biological indicators, transparency, total phosphorous, and total nitrogen. In contrast a flowing stream for the same aquatic life protection may require information on biological indicators, periphyton biomass, dissolved oxygen, pH, soluble reactive phosphorous and total nitrogen (DIN). Similar concerns will need to be addressed in finding the appropriate monitored indicators protective of recreational and water supply designated uses for stream, lakes and reservoirs.

NJDEP, in alignment with EPA's recommendation (USEPA 2002), is investigating eco-regional specific nutrient criteria based on linking stressors (i.e., total phosphorous, nitrogen) with biological responses (i.e., periphyton diatoms, biomass, Chlorophyll a, diurnal DO, turbidity, etc.). Active field investigations and site specific studies are currently underway to investigate the relationships between nutrients (stressors) and response indicators (e.g. chlorophyll a, algal biomass and algal community structure) to determine if predictive stressor-response models may be constructed which are protective of designated uses and which can be used in future assessments. Through both applied research (e.g., algal densities) and practical re-assessments of historical data (e.g., nutrient cycling, watershed location, seasonality and stream flow) we will attempt to reconcile designated uses with monitored waterbodies.

**Dissolved Oxygen:** When assessing diurnal dissolved oxygen data, the individual analyses for a 24-hour period are averaged together for comparison to the 24-hour average criteria. For evaluation of the "not less than at any time" criteria the lowest DO value of the 24 hour period will be compared to the "not less than any time" criteria.

**Fecal Coliform:** Please refer to Section 5.2 for the fecal coliform assessment methods under the recreation designated use assessment method.

**Modified Water Quality Assessment:** A modified assessment method is provided for datasets that do not meet the preferred data requirements but still have value in assessing water quality. Examples

of this type of data may include: 1.) datasets of less than 10 samples; 2.) sampling less than quarterly frequency; or 3.) the duration of sampling is less than 2 years. Datasets of these types are evaluated on a case-by-case basis to determine if the data characterize the range of water quality variation that adequately represent conditions of existing water quality. If it is determined that data do not adequately represent existing water quality conditions based on these or other possible qualifying factors, the result will be an assessment of “insufficient data”. Additionally, only one exceedance is not sufficient to determine the attainment status of a site, therefore, “non attainment” waters require at least two exceedances to confirm water quality does not meet SWQS. This ensures that even with additional sampling, which would meet the recommended data requirements, the assessment result will not change. When the modified water quality assessment is used, the basis and rationale for using the data will be explained in the Integrated Report with the assessment results.

The assessment methodology for conventional water quality parameters is outlined in Table 4.2, below.

**Table 4.2: Conventional Water Quality Parameters Assessment Method**

<b>Assessment Method</b>	<b>Result</b>
<b>Water Quality Assessment for Recommended Sampling Protocol</b>	
10% or less of samples exceed applicable SWQS or excursions due to natural conditions	Full Attainment
Threatened Waters: Less than 10% of samples exceed applicable SWQS, but degrading WQ trends indicate SWQS are likely to be exceeded in more than 10% of samples within 2 years	Non Attainment
More than 10% of samples exceed applicable SWQS	Non Attainment
<b>Modified Water Quality Assessment</b>	
No samples exceed applicable SWQS or excursions due to natural conditions	Full Attainment
One (1) sample exceeds applicable SWQS	Insufficient Data
Data does not adequately represent existing water quality conditions	Insufficient Data
Two (2) or more samples exceed applicable SWQS	Non Attainment

**4.1.3 Development of an Assessment Method for Probabilistic Sampling Results:** Probabilistic sampling design is based on a random selection of sampling locations so each location has an equal chance of being sampled. This approach strengthens the statistical basis for data analysis since many statistical tests assume a probabilistic sampling design. Therefore, alternative assessment methods may be appropriate and necessary to evaluate data from probabilistic designs.

EPA recommends that states include probabilistic sampling to increase the number and percentage of waterbodies assessed. While probabilistic sampling can provide reasonable estimates of water quality with known confidence, application of the results to specific stream reaches is challenging. As discussed in Appendix II, the NJDEP’s redesigned ASMN includes a probabilistic sampling component through the statewide status stations which are selected at random every year from the pool of ~800 AMNET sites. These ~800 sites are considered to be representative of a variety of watershed characteristics including land use, basin size and population density, based on an analysis done by USGS for the 2000 New Jersey Water Quality Inventory Report (NJDEP, 2001). New Jersey’s probabilistic design is currently stratified by WMA: two statewide status sites per WMA are sampled quarterly for one year. While this approach facilitates broad spatial distribution of the

randomly selected sites, the results cannot be readily applied to specific stream reaches as required for assessments in the Integrated Report (at this time).

Although EPA's 2002 Guidance (See Appendix I) states that assessment units sampled through a probabilistic design may not have enough data to make attainment decisions and should be placed in Sublist 3, this approach minimizes the usefulness of probabilistic monitoring resources for Integrated Reporting. The following approaches were implemented by the Department to better utilize the statewide status station data:

1. Compared statewide status station data to data from sites with 8 or more samples if their spatial extent overlap determined by the spatial extent method described in Section 6.
2. If assessment results were the same, extended the spatial assessment to include the statewide status station.
3. If assessment results were not the same, used the modified assessment method described above for stations with less than 8 samples.
4. Assessed the waterbody as "Full Attainment" if the maximum concentration at a statewide status station was less than 50% of the applicable criterion (this percentage is recommended because it indicates very good water quality and could be tested with data from sites with greater than 8 samples).

The Department will evaluate the following approach for improving the assessment and utilization of probabilistic sampling data for the future.

5. Aggregate data from statewide status sites based on various factors such as fall line, drainage area and land use utilizing GIS and the work completed to determine basin size and land uses for each of the 800 AMNET sites. If results indicate we can state with confidence (e.g., 95% level) that statewide status stations with smaller than X drainage and more than Y undeveloped land meet applicable criteria for one or more parameters, assess all statewide status sites with these characteristics as "full attainment". Conversely, if sites with other characteristics are estimated with significant confidence to not attain SWQS, assess all sites in that group as "Non Attainment".

#### **4.2 Toxic Water Quality Parameters Assessment**

Toxic parameters include unionized ammonia, metals, and organics. Organics include current and historical pesticides and volatile organic compounds (VOCs). Assessment methods for these parameters are discussed in Table 4.3 below. Unionized ammonia is calculated from total ammonia concentrations using pH and temperature at the time of sampling.

**Table 4.3: Data Requirements Specific to Toxic Water Quality Parameters (except for metals in non-tidal waters)**

<b>Data Considerations</b>	<b>Data Requirements</b>
Minimum Number of Samples	At least 10 samples. Less than ten samples may be considered on a case-by-case basis. See Modified Water Quality Assessment under Section 4.1.2.
Minimum Sampling Frequency	Data collected quarterly, over a 2-year period. Other frequencies may be considered on a case-by-case basis. See Modified Water Quality Assessment under Section 4.1.2
Data Age	Most recent 5 years of readily available data. Data more than 5 years old may be used on a case-by-case basis. (for example, older data could be used if conditions in the water body have not changed, or if the older data are used in conjunction with newer data to demonstrate water quality trends where appropriate analytical methods are used and results can easily be compared with more recent data).
Spatial Extent of Assessment	Determined for each site using the spatial assessment method described in Section 6

The Department began collecting data for organics at its statewide status stations in 1997 through the redesigned ASMN. The statewide status stations are selected at random every year from the pool of ~800 AMNET sites. This probabilistic design is discussed in detail in Section 4.1.3. While this approach facilitates broad spatial distribution of the randomly selected sites, the data quantity and frequency is insufficient to meet the data requirements for assessments in the Integrated Report. NJDEP is investigating statistical approaches for developing probabilistic assessment methodologies (See Section 4.1.3: Development of an Assessment Method for Probabilistic Design) that would enable this data to be utilized in future Integrated lists. Table 4.4 below, summarizes the assessment methodology for toxic parameters with the exception of metals in non-tidal waters.

**Table 4.4: Toxic Water Quality Parameters (except for metals in non-tidal waters) Assessment Method**

<b>Assessment Method</b>	<b>Assessment</b>
<b>Water Quality Assessment for 10 or More Samples</b>	
Less than or equal to 1 exceedence in 3 years of applicable SWQS criteria for AQLc or excursions were due to natural conditions	Full Attainment
Threatened Waters: Less than or equal to 1 exceedence in 3 years of applicable SWQS criteria for AQLc, but degrading WQ trends indicate SWQS are likely to be exceeded within 2 years	Non Attainment
More than 1 exceedence in 3 years of applicable SWQS criteria for AQLc or included on 1998 Impaired Waterbodies List and no new data available.	Non Attainment
<b>Water Quality Assessment for 4-9 Samples</b>	
All samples meet SWQS or excursions were due to natural conditions	Full Attainment
One (1) sample exceeded applicable SWQS	Insufficient Data -
Data does not adequately represent existing water quality conditions	Insufficient Data
Two (2) or more samples exceeded applicable SWQS	Non Attainment



#### 4.2.2 Metals Assessment (in non-tidal waters)

An Interagency 303d Technical Workgroup including representatives from NJDEP, USEPA Region II and USGS were tasked with developing a water quality assessment procedure for metals. This workgroup developed a procedure using New Jersey's Whippany River Watershed in a pilot project as per the USEPA Region 2 and NJDEP Memorandum of Agreement (MOA) for TMDL development (March 13, 2000). This metals procedure will be applied in assessing the results from the previous NJ Impaired Waterbodies List and current data.

#### Data Requirements for Assessment of Metals in non-tidal waters

In addition to the requirements provided in Section 3 (General Data Requirements) the following specific data requirements noted in Table 4.5 will be required for the assessment of metals.

**Table 4.5: Data Requirements for Assessment of Metals (non-tidal waters)**

<b>Data Consideration</b>	<b>Data Requirements</b>
Minimum Sampling Frequency	At least 4 samples
Data Age	The most recent 5 years of readily available data
Flow Considerations	Three (3) stable baseflow samples and one (1) elevated flow sample recommended; Direct flow measurement preferred for baseflow samples, USGS should calculate flows from nearby stations as needed. See Notes below.
Metal Fraction	Total recoverable (TR) and dissolved fraction (DF) as needed for comparison to SWQS; Lab filter for DF preferred.
Spatial Extent of Assessment	Determined using the method for Statewide Status Stations described in Section 6.1.2: Spatial Extent of Ambient Stream Monitoring Network Stations
<b>Notes:</b> <b>Stable Baseflow:</b> flows that are above SWQS design flows, below long term daily median flow and less than 30% change from the previous day. <b>Elevated flow:</b> flows that are 10% or more above long term daily median flow.	

**Form of Metal:** Surface Water Quality Standards (SWQS) criteria for metals include human health (HH), acute aquatic life (AQLa) and chronic aquatic life (AQLc). HH criteria are based on total recoverable (TR) form of the metal to protect human health from all forms of metals. Most AQL criteria are based on dissolved fraction (DF\_ form of the metal; exceptions are AQLc for mercury and AQL for selenium. AQL criteria for cadmium, copper, lead, nickel, silver, and zinc were calculated based on hardness at the time of sampling. The applicable criterion decreases as hardness decreases, due to the increased bio-availability of metals in low hardness waters.

To the extent available, total recoverable (TR) and dissolved fraction (DF) data will be compared to TR and DF criteria, respectively. Note that only TR data are collected in the Ambient Stream Monitoring Network (ASMN). TR concentrations above DF criteria will trigger additional sampling and not TMDL development.

**Minimum Detection Limit:** In some cases, the analytical minimum detection limit (MDL) is higher than the applicable criterion (i.e., concentrations at or below the criterion are not measurable). This occurs for arsenic (MDL: 1 part per billion (ppb), HH criterion: 0.017 ppb); and mercury (MDL: 0.04

ppb, AQLc criterion: 0.012 ppb). In low hardness waters, AQLc criteria for cadmium, copper and lead will not be measurable in some samples. An exceedence will not be identified if the criterion and metal concentration are below the MDL; analyses with lower MDLs will be sought. An exceedence is identified if the criterion is below the MDL and the metal concentration is above the MDL and thus the criterion.

**Aluminum, Beryllium and Iron:** The 1998 303d List includes waterbodies that were identified as impaired for aluminum, beryllium and iron. Beryllium listings in FW and PL streams were based on criteria proposed by NJDEP that was later withdrawn.. Iron listings were based on exceedences of Drinking Water Secondary Maximum Contaminant Level for iron. The secondary MCL is provided for taste and odor considerations, as the iron does not pose a threat to human health. NJDEP and Federal SWQS do not include criteria for iron, beryllium, or aluminum.

The SWQS include a provision to protect against “toxic substances in toxic amounts” in N.J.A.C. 7:9B-1.5 (a). The criteria development process would include an evaluation of risks to human health and aquatic life for these metals and the development of appropriate criteria. Beryllium, aluminum, and iron will not be assessed since criteria are not available.

**Table 4.6: Metals (non-tidal waters) Assessment Method**

<b>Water Quality Assessment Method for Metals (non-tidal waters)</b>	<b>Assessment</b>
Applicable criterion is met in 3 stable baseflow samples and 1 elevated flow sample, with or without application of waterbody specific DF/TR ratios; or excursions are due to natural conditions (See notes)	Full Attainment
Applicable criterion is measurable and not met in any one of at least 3 stable baseflow and 1 elevated flow samples.	Non-Attainment
One or more of the following applies: <ul style="list-style-type: none"> <li>• Applicable criterion is not measurable;</li> <li>• Data from at least 3 stable baseflow and 1 elevated flow data are not available;</li> <li>• TR data from the ASMN exceeds an applicable dissolved criterion;</li> <li>• Elevated concentrations approaching or above the criterion occurred in field or laboratory blanks</li> </ul>	Insufficient Data
<b>Notes:</b> <b>Stable Baseflow:</b> flows that are above SWQS design flows, below long term daily median flow and less than 30% change from the previous day. <b>Elevated flow:</b> flows that are 10% or more above long term daily median flow.	

## **5.0 Assessment Method for Designated Use Attainment**

The SWQS identify specific designated uses for the waters of the State according to their waterbody classifications. Designated uses include aquatic life, recreational, fish consumption, drinking water, industrial water supply, and agricultural water supply. The Department uses both numeric and narrative criteria to protect designated uses. Narrative criteria are descriptions of the conditions necessary for a waterbody to attain its designated uses while numeric criteria are concentrations values deemed necessary to protect designated uses. To implement narrative data which is qualitative in nature, the Department has identified assessment approaches to quantitatively interpret narrative criteria. Section 5 outlines the assessment methodologies for designated use attainment that include the utilization of both numeric and narrative criteria.

### **5.1. Aquatic Life Designated Use Assessment**

The water quality requirements of many diverse species of aquatic life vary and are difficult to measure. Attainment of many of the numerical SWQS criteria are intended to protect aquatic life from the detrimental effects of poor water quality (e.g., dissolved oxygen, temperature, toxic pollutants). Attainment of SWQS for these parameters is discussed in Section 4. It is also important to evaluate important aquatic communities as direct indicators of aquatic life designated use attainment. Currently, numerical biocriteria for assessment of aquatic life designated uses have not been adopted in the SWQS. The assessment of aquatic life designated uses is based on evaluation of existing and readily available biological community data. Dissolved oxygen is used as a surrogate for biological data in coastal waters because biological data are not available.

#### **5.1.1 Aquatic Life Designated Use Assessment Method for Lakes**

##### **Data Sources for Aquatic Life Designated Use Assessment for Lakes**

Fish populations are sampled using methods such as electrofishing, shoreline seining, and/or gillnetting. Population assessments are then performed by experienced fishery biologists for the purpose of determining the lake's actual or potential recreational value as a fishery. These assessments are based upon the diversity of a wide range of fish species and not just of species possessing recreational value. Species stocked by the Department are also identified and addressed in these assessments.

##### **Data Requirements Specific to Aquatic Life Designated Use Assessments in Lakes**

In addition to the requirements provided in Section 3 (General Data Requirements) the following are specific data requirements for the assessment of aquatic life designated uses in lakes are noted in Table 5.1 below. The aquatic life designated use assessment methods for lakes are outlined in table 5.2.

**Table 5.1: Data Requirements Specific to Aquatic Life Designated Use Assessments for Lakes**

<b>Data Considerations</b>	<b>Data Requirements</b>
Sampling frequency	Sufficient to establish recruitment capability
Field QC	Field identification should be carried out by qualified fishery biologists
Assessment references	Nielsen, L. and Johnson, D. 1983, <u>Fisheries Technique</u> . American Fisheries Society. Murphy, B. and Willis, D. 1996. <u>Fisheries Technique</u> , 2 <sup>nd</sup> ed. American Fisheries Society.
Spatial extent	Assessment should be lake-wide

**Table 5.2: Aquatic Life Designated Uses Assessment Method for Lakes**

<b>Aquatic Life Designated Uses Assessment Method for Lakes</b>	<b>Result</b>
Fishery is well balanced, exhibiting good diversity. Consistent recruitment.* No one species dominates the community. No observable factors limiting the fishery.	Full Attainment
Threatened Waters**: Fully supported fishery, however, anticipated changes in surrounding land use, lake water levels or in-lake water quality have the potential to cause future declines in fishery quality.	Non Attainment
Fishery assessments lacking or insufficient to assess fishery status	Insufficient Data
Fisheries present, however, fish diversity not at potential expected for the type of lake in question. Predators to prey populations are not in balance, inconsistent recruitment*.	Non attainment
Fishery exhibits poor diversity. Fishery dominated by a few tolerant species (carp, goldfish, mudminnows, killifish, etc) and/or general overall number of individuals is low. Poor recruitment* and growth of individuals.	Non attainment
<p>*<i>Recruitment</i> refers to the number of young fish, which survive to ultimately become large enough to reproduce and/or become harvestable. For example: reproduction of a number species of fish in a lake may be good but there may be insufficient habitat cover resulting in many of these fish being eaten by their larger counterparts before they grow to sufficient size to either reproduce or be sought after by anglers. In such a scenario, recruitment is regarded as poor.</p> <p>**Note that because of the nature of the information that form the basis of the “<i>Threatened</i>” category as it applies to lake aquatic life assessments, the strict 2-year window applied to conventional parameters is not applied here. “Threatened” status here operates within a broader time window, which could encompass a period of, for example, 5 years.</p>	

### 5.1.2 Aquatic Life Designated Use Assessment in Rivers

**Benthic Macroinvertebrate Data Assessment:** Biological assessment provides a direct measurement of aquatic life beneficial uses. The occurrence of bottom dwelling organisms, such as insects, crustaceans, snails, and worms (i.e., benthic macroinvertebrates) is monitored in non-tidal streams. This assessment method is supported by the following findings: occurrence of different aquatic species and communities is limited by environmental conditions, tolerances to pollution, and/or habitat degradation. The occurrence of these tolerant and intolerant organisms is consequently used to screen streams for potential impairments for aquatic life designated uses. All macroinvertebrate sampling is conducted in accordance with USEPA guidance (USEPA 1989) and NJDEP field sampling procedures (NJDEPE 1992). Quality control measures must be consistent with USEPA procedures (USEPA 1999) and all specimen identifications must be performed by a qualified biologist.

An Interagency 303d Technical Workgroup including representatives from NJDEP, USEPA Region II, and USGS were tasked with developing a water quality assessment procedure (see Table 5.3) for application of the macro-invertebrate network in New Jersey and developed a series of recommendations as to how the individual sites should be assessed with respect to the Integrated List. A summary of this effort is delineated in Appendix IV. This procedure will be applied in assessing the results from the previous NJ Impaired Waterbodies List[303(d)] and current AMNET results.

In general, the protocol directs; that an AMNET result indicating a waterway as non-impaired or severely impaired (Non-Pinelands waters) **and** does not conform to items 1, 2 and 3 below will be placed in Sublists 1, 2, or 5 of the Integrated Report (see Table 5.3, below). However, assessment of AMNET Sites of moderately impaired status, not conforming to items 1, 2 and 3 below, will be placed in Sublist 3 of the Integrated Report which will require a reassessment when appropriate protocols are developed:

1. Monitoring sites must be located at points that represent the downstream terminus of a catchment area of 6 sq. mi. or greater;
2. Sites should not be located within 500 feet of a lake or impoundment outlet; and
3. Sites should be sampled between April through November, inclusive.
- 4.

Note: These protocols will not apply to waters contained within the NJ Pinelands Area because of the unique nature of the low pH adapted organisms within these waters (i.e., PL designated surface waters as per N.J.A.C. 7:9B). These waters include both “Preservation” and “Protection” areas within the Pinelands, the Mullica and Great Egg Harbor River watersheds as well as the eastern portions of some Delaware tributaries, which also possess low pH characteristics.

**Table 5.3: Macroinvertebrate Assessment Method**

<b>Data Assessment</b>	<b>Result</b>
Assessments from locations in Pinelands waters (PL designations)	Further Assessment required
<b>The following applies only to non-PL waters:</b>	
Non-PL waters assessed as Non-Impaired	Attainment
Non-PL waters assessed as Severely Impaired	Non Attainment
Non-PL waters assessed as Moderately Impaired but falling under sublists 1 – 5 below:	
1) Sites at points that drain a catchment area of less than 6-sq. mi.	Further Assessment required
2) Sites at points that drain a catchments area of 6 sq. mi. or greater:	Non Attainment
3) Sites located within 450 feet of a dam (impoundment outlet)	Further Assessment required
4) Sites assessed based upon April to November (inclusive) samples	Non Attainment
5) Sites assessed based upon December to March samples	Further Assessment required

**Flow Effects:** Research by the USGS has indicated that insufficient base flow can have detrimental effects on aquatic macroinvertebrate populations. The Department is currently investigating this issue more closely through several research projects being performed in cooperation with the USGS. The Department realizes that in some cases, non attainment of use may be due to extended drought conditions and this, in turn, may influence how the individual AMNET sites are (or will) be assessed with regards to use support. If sites reflect impaired status due to extensive drought induced low flow conditions that are not known to be anthropogenically aggravated, they will be assigned to sublist 3 pending a re-assessment.

### **5.1.3 Aquatic Life Designated Use Assessment Method for Tidal Waters**

Dissolved oxygen (DO) is necessary for most aquatic life forms and monitoring data for DO in tidal waters is readily available through existing monitoring networks. Therefore, DO status is used as an indicator for tidal water aquatic life designated use assessment. However, because many open water aquatic species are mobile and/or naturally tolerant of transient low DO occurrences DO is an indirect indicator of aquatic life designated uses. Additional data and assessments are needed to develop a direct indicator of aquatic life designated use attainment in tidal waters.

#### **Data Requirements Specific to Aquatic Life Designated Use Assessment in Tidal Waters**

In addition to the requirements provided in Section 3 (General Data Requirements) data requirements for assessments of aquatic life designated uses in tidal waters are described below and summarized in Table 5.4:

- ◆ **Estuarine Waters** - The aquatic life assessment method is based upon quarterly subsurface dissolved oxygen (DO) levels recorded within a recent five-year time span. Water column DO levels are based upon criteria contained within New Jersey's Surface Water Quality Standards (N.J.A.C. 7:9B). Assessment and listing methodology are summarized in Table 4.2 .
- ◆ **Ocean Waters** -Aquatic life assessment for New Jersey territorial ocean waters is based on water column DO levels (Sampled June to September) collected by the USEPA Region II helicopter survey and by monitoring conducted by the NJDEP's Bureau of Marine Water Monitoring. Although EPA monitors transects that extend nine miles off the New Jersey coast; for the purposes of this NJ Integrated Report the assessment of data will be confined to only the innermost 1 and 3 mile transect points (Figure 1). Assessments are based on dissolved oxygen values recorded one meter above the ocean bottom. Water column DO levels are based on criteria contained within New Jersey's Surface Water Quality Standards (N.J.A.C. 7:9B). Assessment and listing methodology are summarized on Table 4.2. USEPA Region 2 has found, over many years of monitoring, that surface DO levels are consistently acceptable (DO is at or above 5mg/l) within the waters they survey. Based on Region 2 findings regarding surface DO levels, EPA has discontinued monitoring of DO in surface waters, and NJDEP assumes that surface DO is at or above 5mg/l. In contrast, nearshore DO monitoring by NJDEP has found frequent contravention of the subsurface DO standard within the southerly portions of the coast. These have been factored into the Department's use support assessment of Ocean Waters.

**Table 5.4: Data Requirements for Assessment of Aquatic Life Designated Uses in Tidal Waters**

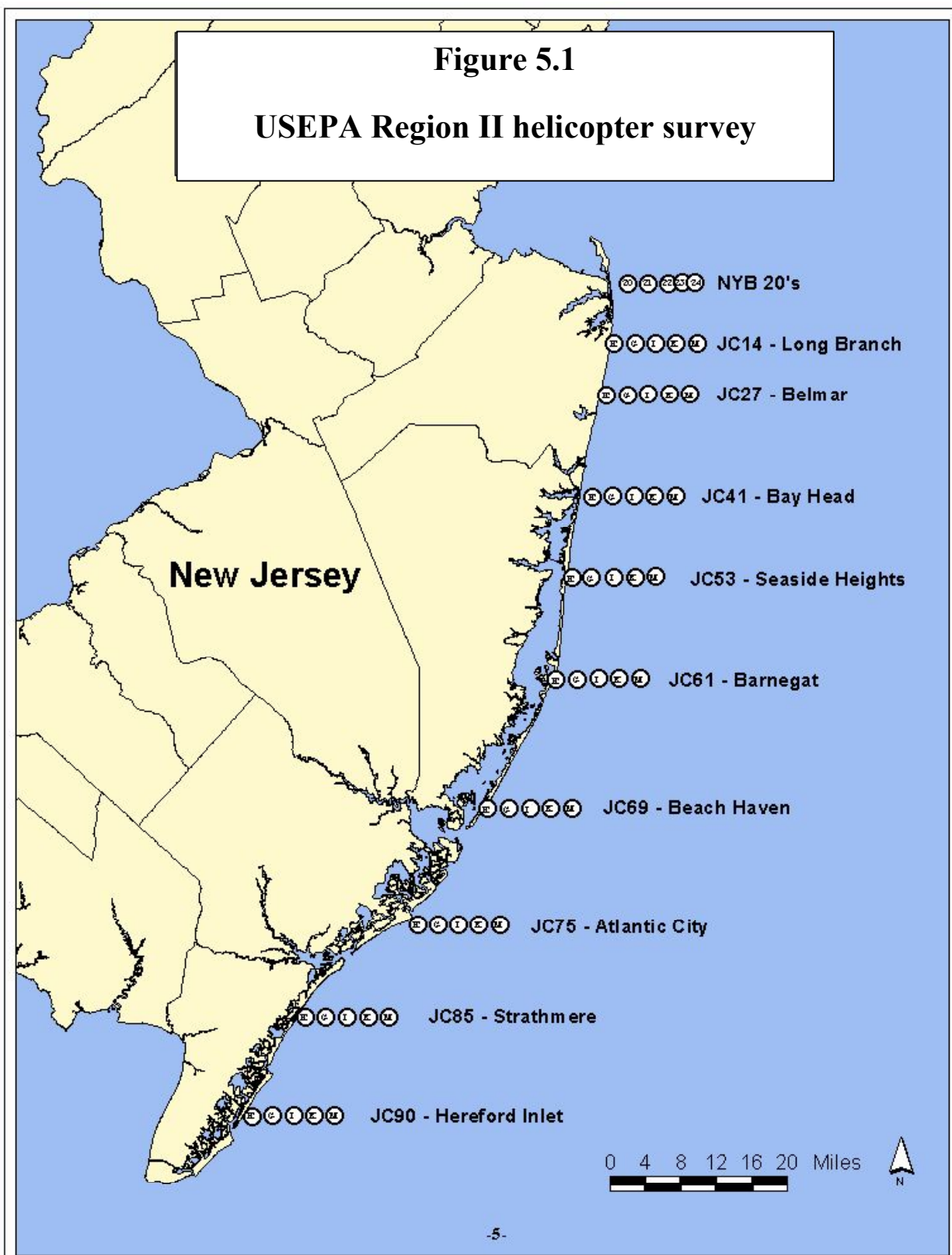
<b>Data Considerations</b>	<b>Data Requirements</b>
Minimum Sampling Frequency	Quarterly sampling in tidal rivers, back bays and inlets; Weekly sampling in the ocean during the summer
Data Age	Most recent 5 years of readily available data
Tidal Considerations	None
Spatial Extent	See Section 6

#### **Aquatic Life Designated Use Assessment Method**

Dissolved oxygen measurements were compared to applicable criteria as described in Table 5.5. For ocean stations, surfaced measurements were used, and for estuarine stations, mid-water column measurements were used.

Note: In contrast to surface DO levels, the EPA monitoring has found benthic low DO conditions off the New Jersey coast for most of its length during the quiescent periods of the summer and early fall.

These are brought about by the thermal stratification that establishes in this period. Storms and the onset of autumn bring about surface to bottom mixing resulting in a breakup of these low DO conditions until the onset of warmer temperatures again in June. The impacts to benthic aquatic life





and the possible anthropogenic contributions to these benthic conditions are currently unknown. Therefore, the benthic coastal waters will be assigned to sublist 3 to under go further assessments as to these unanswered questions.

**Table 5.5: Aquatic Life Designated Use Assessment Method for Tidal Waters\***

<b>Aquatic Life Designated Use Assessment Method for Tidal Waters</b>	<b>Result</b>
10% or less of samples exceed applicable SWQS criterion for dissolved oxygen or excursions were due to natural conditions	Full Attainment
Threatened Waters: Less than 10% of samples exceed applicable SWQS criterion for dissolved oxygen, but degrading WQ trends indicate SWQS are likely to be exceeded in more than 10% of samples within 2 years	Non Attainment
More than 11% of samples and at least 2 samples exceeded applicable SWQS criterion for dissolved oxygen	Non Attainment

\* Surface Waters only.

## **5.2 Recreational Designated Use Attainment**

Recreational designated use is applied to streams, ocean, bay and lake bathing beaches and to tidal open waters. Recreational designated uses include primary and secondary contact recreation which are defined as follows:

- Primary Contact Recreation: Recreational activities that may involve significant ingestion risks and includes, but is not limited to, wading, swimming, diving, surfing, and water skiing.
- Secondary Contact Recreation: Recreational activities where the probability of water ingestion is minimal and includes, but is not limited to, boating and fishing.

### **Data Requirements Specific to Recreational Designated Use Assessment**

In addition to the requirements provided in Section 3 (General Data Requirements), specific data requirements for assessments recreational designated uses are described in Table 5.6 below.

**Table 5.6: Data Requirements for Assessment of Recreational Designated Uses**

<b>Data Considerations</b>	<b>Data Requirements for Assessment of Recreational Designated Uses</b>
Minimum Sampling Frequency	<p><u>Streams</u>: : For comparison of individual samples with the SWQS, five samples collected within 30 days at least once per year is preferred. Samples may be collected quarterly for a minimum of 2 years. However, the calculation of a geometric mean requires five samples collected within 30 days.</p> <p><u>Lake Beaches</u>: At least 10 samples collected during the summer; beach closure data not available, fecal coliform data used for assessment</p> <p><u>Ocean and Bay Beaches</u>: at least weekly during summer, additional sampling as needed for closures; beach closure data used for assessment</p> <p><u>Tidal open water</u>: Quarterly sampling in tidal rivers, back bays and inlets</p>
Data Age	<p><u>Streams</u>: Data collected within the last 5 years</p> <p><u>Lake Beaches</u>: Data collected within the last 5 years</p> <p><u>Ocean and bay beaches</u>: Data collected within the last 5 years</p> <p><u>Tidal open water</u>: Data collected within the last 5 years.</p>
Tidal Considerations	Open water samples collected under low or outgoing tide in tidal rivers, back bays and inlets
Spatial Extent of Assessment	<p><u>Streams</u>: See Section 6</p> <p><u>Lake Beaches</u>: See Section 6</p> <p><u>Ocean and bay beaches</u>: 138 back bay beaches estimated to be 150 feet long (beachfront) x 100 feet wide (3.9 square statute miles); 127 miles of ocean beaches estimated to be 150 feet wide</p> <p><u>Ocean open waters</u>: See Section 6</p> <p><u>Other tidal open waters</u>: See Section 6</p>

### **Recreational Designated Use Assessment Method**

Fecal coliform levels in water are used as the primary indicator of sanitary quality. Assessments are conducted at lakes, ocean and bay bathing beaches, and in open tidal waters because recreational contact through water sports is likely. Some of New Jersey's rivers and streams, particularly those in the Pinelands, are used for swimming and secondary contact recreational activities, such as canoeing. Other rivers are not accessible or safe for these activities (e.g., steep banks, rapids, and private property). This assessment considers sanitary quality of rivers, and does not consider recreational beach amenities or access to the stream. The assessment methods for recreational designated use are outlined in Table 5.7 below.

**Table 5.7: Recreational Designated Use Assessment Method**

<b>Recreational Designated Use Assessment Method</b>	<b>Result</b>
<b>1. Primary Contact Assessment for Non-tidal Rivers (FW2) and Open Tidal Waters (SE1 and SC between 1500 feet and 3 miles from Shore)</b>	
The FC geometric average was less than 200 MPN/100ml and less than 10 percent of individual samples exceeded 400 MPN/100 ml or excursions were due to natural conditions	Full Attainment
Threatened Waters: Less than 10% of samples exceed applicable SWQS, but degrading WQ trends indicate SWQS are likely to be exceeded in more than 10% of samples within 2 years	Non Attainment
The FC geometric average was greater than 200 MPN/100ml or greater than 10 percent of individual samples exceeded 400 MPN/100 ml. If sample size is less than 10, must have at least 2 violations.	Non Attainment
<b>2. Primary Contact Assessment for Open Tidal Waters (SC within 1500 feet of Shore)</b>	
The FC geometric average was less than 50 MPN/ 100 ml	Full Attainment
Threatened Waters: The FC geometric average was less than 50 MPN/ 100 ml but degrading WQ trends indicate SWQS are likely to be exceeded within 2 years	Non Attainment
The FC geometric average was greater than 50 MPN/ 100 ml	Non Attainment
<b>3. Secondary Contact Assessment for Open Tidal Waters (SE2)</b>	
The FC geometric average was less than 770 MPN/ 100 ml	Full Attainment
Threatened Waters: The FC geometric average was less than 770 MPN/ 100 ml but degrading WQ trends indicate SWQS are likely to be exceeded within 2 years	Non Attainment
The FC geometric average was greater than 770 MPN/ 100 ml	Non-attainment
<b>4. Secondary Contact Assessment for Open Tidal Waters (SE3)</b>	
The FC geometric average was less than 1500 MPN/ 100 ml	Full Attainment
Threatened Waters: The FC geometric average was less than 1500 MPN/ 100 ml but degrading WQ trends indicate SWQS are likely to be exceeded within 2 years	Non Attainment
The FC geometric average was greater than 1500 MPN/ 100 ml	Non-attainment
<b>Ocean and Bay Bathing Beach Assessment Method</b>	
Less than or equal to 10% of 100 beach days are closed per year	Full Attainment
Greater than 10% of 100 beach days are closed per year	Non Attainment
<b>Lake Bathing Beach Assessment Method</b>	
Less than or equal to 10% of summer samples exceed NJDHSS bathing beach standards	Full Attainment
At least 2 samples and greater than 10% of samples exceed NJDHSS bathing beach standards	Non Attainment

### 5.3 Lake Aesthetic Quality Assessment Method

The aesthetic quality of lakes is an important aspect in the maintenance of recreational uses since swimming and boating uses may be impaired by nuisance algal growth and sedimentation due to eutrophication. In addition to the numerical water quality criteria for total phosphorus, the SWQS include narrative criteria and nutrient policies. The narrative criteria - All waters should be free from substances that produce undesirable aquatic life or result in the dominance of nuisance

species. The narrative nutrient policies preclude “nutrient concentrations that cause objectionable algal densities, nuisance aquatic vegetation or render waters unsuitable for designated uses.” Recreational use support is also assessed from a sanitary perspective in Sect. 5.2. Many of the lakes in New Jersey are constructed impoundments and highly prone to eutrophication. Eutrophication occurs naturally as lakes age, however, this process can accelerate from excessive inputs of nutrients and suspended sediments from surrounding watersheds. Eutrophic lakes are characterized by excessive growth of aquatic weeds and algae, shallow depths as sediments fill the lake. Severely eutrophic lakes may experience elevated temperatures and low dissolved oxygen. Information for data sources is provided in Appendix 2.

### 5.3.1 Data Requirements Specific to Lake Aesthetic Quality Assessment

In the past, lake impairment issues have been brought to the attention of NJDEP principally through four programs:

1. New Jersey Lake Management Program Reports (NJLMP);
2. Clean Lakes Program Phase I diagnostic studies (CLP);
3. Lake Water Quality Assessment Reports (LWQA) and
4. Lake Intensive Surveys performed prior to 1980 (LIS).

Lake Reports through Programs 1 and 2 above occurred in response to perceived impairments by local authorities for lake recreational uses brought about by eutrophication. LWQA reports and LIS (No 3 and 4) represent lake investigations performed by NJDEP for assessing general water quality in New Jersey lakes and were not always in response to reported impaired recreational uses. In order to insure that the TMDL process is appropriately applied to eutrophic lakes with known recreational impairment, the Department will assign eutrophic lakes to the following categories within the Integrated Assessment as noted in table 5.8 below.

**Table 5.8 Recreational Use Support Assessment Methodology for Eutrophic Lakes**

Lake Assessment	Recreational use support status
• New Jersey Lake Management Program Report	Non Attainment*
• Clean Lakes Program Phase I and II diagnostic Studies	Non Attainment*
• Lake Water Quality Assessment Report	Status not determined
• Lake Intensive Survey	Status not determined
• All lakes assessed as <u>mesotrophic</u> , regardless of assessment method or lakes, which have been successfully remediated and have had their recreational use restored.	Attainment

\*Unless information indicates that the use impairment has been subsequently remediated in which case the use may be regarded as fully supporting.

The Department will review all information sources which document restoration efforts for use impaired lakes. If it is shown that the recreational uses have been restored, the lake will be categorized as fully meeting its recreational use and placed into the corresponding sublist of the Integrated List.

Although many of the lake assessments discussed here may be twenty years old the condition of the lake (with regards to recreational use support) is considered the same as that delineated in the

original assessment. This rationale is based on the observation that unless a remedial action has taken place on an impaired lake, its condition (in regards to use impairment) through natural lake succession, is not expected to improve through time.

In addition to the requirements provided in Section 3 (General Data Requirements) specific data requirements for assessments of lake aesthetic quality are described in Table 5.9 below.

**Table 5.9: Data Requirements for Assessment of Lake Aesthetic Quality**

<b>Data Considerations</b>	<b>Data Requirements</b>
Minimum Sampling Frequency	The minimum sampling frequency was determined on a site-specific basis for each lake and ranged from limited studies to very thorough studies to document known eutrophication issues. Lakes were also monitored after any remediation strategies were implemented.
Data Age	Collected within the most recent 5 years*
Seasonal Considerations	Data collection includes summer sampling
Lake Selection	<b>NJLMP and CLP:</b> Public lakes with recreational uses affected by eutrophication were selected by municipalities, lake management entities and NJDEP for investigation and remediation. <b>LWQA and LIS:</b> Lakes selected to represent a cross section of lakes in NJ. Recreational use support not always considered. Selections tended towards better quality lakes.
Spatial Extent	Assessments apply to the entire lake.

\* The department reserves the right to regard lakes as use impaired if assessments are as much as twenty years old if no remedial action has been taken in response to lakes impaired status.

### 5.3.2 Lake Aesthetic Quality Assessment Method

Use support status is based upon narrative standards in addition to the numerical water quality criteria for total phosphorus (N.J.A.C. 7:9B-1.5(g), which applies to all freshwaters of the state. The narrative nutrient policies preclude nutrient concentrations that cause objectionable algal densities, nuisance aquatic vegetation or render waters unsuitable for designated uses. Lake trophic status assessments were conducted using USEPA's Clean Lakes Program Guidance Manual (USEPA, 1980). Consideration may also have been given to documented impairments caused by other factors, such as excessive macrophyte growth, sedimentation or bacterial contamination affecting lake beaches. In the future, trophic status of lakes will be assessed based upon the Department's developing policies regarding nutrients. In addition, USEPA's Clean Lakes Program Guidance Manual provides target levels (Table 5.10) for some in-lake parameters for the purpose of guiding lake remediation

**Table 5.10: Lake Target Levels For Selected Parameters As Per USEPA’s Clean Lakes Program Guidance Manual.**

<b>Data Assessment</b>	<b>Trophic Status Classification</b>
If all of the following exist: <ul style="list-style-type: none"> <li>• Total phosphorus less than 0.02 ppm TP (winter mean)</li> <li>• Chlorophyll <i>a</i> less than or equal to 5 – 10 ppb Chl<i>a</i> (summer)</li> <li>• Transparency greater than or equal to 1.5 meters (summer)</li> </ul>	Mesotrophic
If one or more of the following exist: <ul style="list-style-type: none"> <li>• Total phosphorus greater than or equal to 0.02 ppm TP (winter mean)</li> <li>• Chlorophyll <i>a</i> greater than 5 – 10 ppb Chl<i>a</i> (summer)</li> <li>• Transparency less than 1.5 meters (summer)</li> <li>• Excessive macrophyte populations or sedimentation impairing use</li> <li>• Included on 1998 Impaired Waterbodies List and no new data available.</li> </ul>	Eutrophic

As stated earlier, the recreational use support status of lakes and their corresponding listings within the Integrated List are based on assumptions regarding the “actual use support determination” which itself is based upon professional judgment. This in turn leads to a detailed in-lake data collection effort. For lakes in which recreational use status is assessed as “status not determined” the Department will review all readily available information in order to determine its recreational use support and to revise the Integrated List accordingly.

#### **5.4 Fish Consumption Designated Use Assessment Method**

The Department uses fish consumption advisories, which establish whether or not fish is safe for human consumption, to assess compliance with the SWQSs toxic policy and the narrative criteria for toxics. The narrative criteria states that: “Toxic substances – None either alone or in combination with other substances, in such concentrations as to effect humans or be detrimental to the natural aquatic biota, produce undesirable aquatic life, or which would render the waters unsuitable for the desired use.” The toxics policy states: “Toxic substances in waters of the State shall not be at levels that are toxic to humans or the aquatic biota, or that bioaccumulate in the aquatic biota so as to render them unfit for human consumption”

Fish consumption designated use assessments are based on the presence of fish consumption advisories or bans. The data collection, risk assessment and the issuance of fish consumption advisories and bans is overseen by the New Jersey Interagency Toxics in Biota Committee. Through the Interagency Toxics in Biota Committee, research projects are coordinated to monitor levels of contaminants in commercially and recreationally harvested fish, shellfish and crustacean species. Edible portions of individual animals are tested for one or more bioaccumulative chemicals (e.g., PCB’s, chlorinated pesticides, dioxins, and mercury). These data are evaluated for development of consumption advisories and bans as appropriate to protect human health. Fishing advisories are measured against USFDA Tolerances for contaminated food as well as NJ risk assessments performed by Toxic in Biota Committee, a joint effort between the NJDEP and the NJ Department of Health and Senior Services.

Data collection for fish tissue is currently accomplished through research projects. A stable funding source to establish a monitoring network is being sought.

#### **Data Requirements Specific to Fish Consumption Designated Use**

In addition to the requirements provided in Section 3 (General Data Requirements) the following specific data requirements for fish consumption designated uses are described in Table 5.11 below. Currently, PCB/dioxin/pesticide advisories are based on US Food and Drug Administration (FDA) tolerance levels (which are not human health risk-based) which reflect cost-benefit analyses. For mercury consumption advisories, the TIBC used health risk-based mercury guidelines established by the National Research Council report - *Toxicological Effects of Methylmercury*.

**Table 5.11: Fish Consumption Designated Use Assessment Method**

<b>Assessment</b>	<b>Result</b>
No fish restrictions or bans in effect	Full Attainment
“Restricted Consumption” of fish in effect (restricted consumption defined as limits on the number of meals or size of meals consumed per unit time for one or more fish species); or a fishing ban is in effect for a sub-population that could be at potentially greater risk for one or more fish species or included on 1998 Impaired Waterbodies List and no new data available.	Non Attainment
“No consumption”, or fishing ban in effect for general population for one or more fish species; or commercial fishing ban in effect.	Non Attainment
Fish tissue data not available	Unassessed
Statewide advisory based on extrapolated data	Insufficient Data

#### **5.5 Shellfish Harvesting Designated Use Assessment Method**

Shellfish harvesting designated use is applicable in all waters classified as SC in the SWQS. Shellfish harvesting classifications are based on the National Shellfish Sanitation Program (NSSP) requirements (NOAA, 1997). This program is overseen by the federal Food and Drug Administration to ensure the safe harvest and sale of shellfish. Information for data sources is provided in Appendix II.

#### **Data Requirements for Shellfish Harvesting Designated Use Assessment**

In addition to the general data requirements provided in the Quality Assurance section, the following are specific data requirements for assessment of shellfish harvesting designated use attainment as outlined in Table 5.12 below:

**Table 5.12: Data Requirements for Assessment of Shellfish Harvesting Designated Use Attainment**

<b>Data Considerations</b>	<b>Data Requirements for Assessment of Shellfish Harvesting Designated Use Attainment</b>
Sampling Methods	All sampling methods and harvesting classifications are conducted in accordance with the NSSP Manual (NOAA, 1997)
Data Age	Most recent 5 years of readily available data
Sampling frequency	At least 15 samples collected, as specified by NSSP Manual
Spatial Extent	Shellfish harvesting classifications are available for all SC waters

#### **Shellfish Harvesting Designated Use Assessment Method**

The adopted shellfish harvesting classifications are included in the NJ SWQS by reference in N.J.A.C. 7:9B-1.12(g). Based on sampling data and assessment procedures in the NSSP manual, waters are classified for unrestricted harvest, special restricted, seasonal or prohibited. Prohibited areas are further classified into waters where shellfish harvest is prohibited due to poor water quality or administrative closures.

Administrative closures are established in areas around potential pollution sources, such as sewage outfalls and marinas. These areas are closed as a preventive measure to protect shellfish from contamination in areas immediately adjacent to the 15 sewage outfalls in the ocean and from an emergency such as a sewage bypass or break in an outfall pipe. In marinas, prohibited areas are established to protect human health from contamination from boat wastes and runoff. Where closings are based on land use (i.e. marinas, STP outfalls etc.) and there is insufficient water quality data to assess attainment, these areas are identified as not assessed. Where closings are based on land use but there is sufficient data to assess attainment, these areas will be assessed. This assessment methodology (Table 5.13) is consistent with USEPA's guidance on the use of shellfish classifications in 303(d) decisions which states that waters classified "Prohibited" due to administrative closures should not be classified as impaired if data are not available to document an impairment. (USEPA, 2000).

**Table 5.13: Shellfish Harvesting Designated Use Assessment Method**

<b>Shellfish Harvesting Designated Use Assessment</b>	<b>NSSP Classification</b>	<b>Result</b>
Geometric mean of total coliform was less than or equal to 70 MPN per 100 milliliters (ml) and the estimated 90 <sup>th</sup> percentile was less than 330 MPN per 100 ml	Approved	Full Attainment
Administrative Closure with sufficient data and geometric mean of total coliform was less than or equal to 70 MPN per 100 ml and the estimated 90 <sup>th</sup> percentile was less than 330 MPN per 100 ml	Prohibited	Full Attainment
Geometric mean of total coliform was greater than 70 MPN per 100 ml but less than or equal to 700 MPN per 100 ml and the estimated 90 <sup>th</sup> percentile was less than 3,300 MPN per 100 ml	Special Restricted or Seasonal	Non Attainment
Geometric mean of total coliform exceeded 700 MPN per 100 ml and the estimated 90 <sup>th</sup> percentile was greater than 3,300 MPN per 100 ml	Prohibited	Non Attainment
Administrative Closure with insufficient data for assessment	Prohibited	Insufficient Data
Notes: MPN: most probable number (of total coliform bacteria) <i>Approved</i> waters are harvestable without restriction. <i>Seasonal</i> waters that are open seasonally typically opened in the winter. <i>Specially Restricted</i> shellfish require additional treatment (relay or depuration) prior to harvest. <i>Prohibited</i> waters that are closed to the harvesting of shellfish.		

## **5.6 Drinking Water Supply Designated Use Assessment Method**

Drinking water designated use means the waters are potable after conventional filtration treatment and disinfection and do not have consistent removal issues for chemical constituents. Drinking water



designated uses apply to surface waters classified as Pinelands (PL), Freshwater Category 2 (FW2) and DRBC Zones 2 and 3.

Nitrate in surface waters was chosen as an indicator of drinking water designated use attainment because it a primary health concern in finished drinking water and its difficulty to remove from source waters. In addition, information regarding additional treatment to remove chemicals in surface water supplies will be used. Information for data sources is provided in Appendix II.

#### **Data Requirements for Drinking Water Supply Designated Use Assessment**

Data requirements provided previously in Section 3: General Data Requirements and data requirements for assessment of conventionals were used for this assessment.

#### **Drinking Water Designated Use Assessment Method**

Water quality data is compared to 10-ppm nitrate, the maximum contaminant level (MCL) allowable in finished drinking water. Surface waters with PL classifications are compared to 2-ppm nitrate criterion applicable to PL waters in the conventional water quality assessment (see Section 4.1). NJDEP's Safe Drinking Water and Site Remediation Programs provide information regarding additional treatment of surface water supplies to remove chemical constituents. It is important to note that some waterbodies may not have drinking water intakes due to stream size and other considerations. Waterbodies affected by either nitrate or intakes with treatment to remove chemical contaminants were assessed as "non attainment" (see Table 5.14 below).

**Table 5.14: Drinking Water Designated Use Assessment Method**

<b>Water Quality Assessment for 10 or More Samples in 5 Years</b>	<b>Assessment</b>
10% or less of samples exceed 10 ppm nitrate and additional chemical removal treatments are not required on surface water intakes	Full Attainment
Threatened Waters: Less than 10% of samples exceed 10 ppm nitrate, but degrading WQ trends indicate that more than 10% of samples are likely to exceed this concentration within 2 years and/or additional chemical removal treatments are expected to be required on surface water intakes within 2 years	Non Attainment
More than 10% of samples exceed 10 ppm nitrate and /or additional chemical removal treatments are not required on surface water intakes	Non Attainment
<b>Water Quality Assessment for 4-9 Samples in 5 Years</b>	<b>Assessment</b>
All samples had less than 10 ppm nitrate and additional chemical removal treatments are not required on surface water intakes	Full Attainment
Two (2) or more samples exceeded 10 ppm nitrate and /or additional chemical removal treatments are not required on surface water intakes	Non Attainment
One (1) sample exceeded 10 ppm nitrate and additional chemical removal treatments are not required on surface water intakes or fewer than 4 samples	Insufficient Data

#### **5.7 Industrial Water Supply Designated Use Assessment Method**

Industrial water supply designated use assessment was piloted in the 2000 New Jersey Water Quality Inventory Report to waters used for processing or cooling. The Department has selected total suspended solids (TSS) and pH, a measure of acidity, as indicators for industrial water supply use. Information for data sources is provided in Appendix II.

#### **Data Requirements for Industrial Water Supply Designated Use Assessment**

The specific data requirements for assessment of industrial water designated use are described in Section 3: General Data Requirements and assessment of conventionals in surface waters in Section 4.1.

**Industrial Water Supply Designated Use Assessment Method**

Industrial designated uses were met if 10% or less of samples exceeded applicable criteria for pH or TSS. The assessment methodology for industrial water supply designated use is summarized in Table 5.15.

**Table 5.15: Industrial Water Supply Designated Use Assessment Method**

<b>Industrial Water Supply Designated Use Assessment</b>	<b>Assessment</b>
<b>Water Quality Assessment for 10 or More Samples in 5 Years</b>	
10% or less of samples exceeded applicable criteria for pH or TSS	Full Attainment
Threatened Waters: Less than 10% of samples exceeded applicable criteria for pH or TSS, but degrading WQ trends indicate that more than 10% of samples are likely to the criteria within 2 years.	Non Attainment
More than 10% of samples exceeded applicable criteria for pH or TSS or termination of an industrial water supply	Non Attainment
<b>Water Quality Assessment for 4-9 Samples in 5 Years</b>	<b>Assessment</b>
All samples met applicable criteria for pH or TSS	Full Attainment
Two (2) or more samples exceeded applicable criteria for pH or TSS or termination of an industrial water supply	Non Attainment
One (1) sample exceeded applicable criteria for pH or TSS or fewer than 4 samples	Insufficient Data

**5.8 Agricultural Water Supply Designated Use Assessment Method**

Agricultural uses of surface water include irrigation and livestock farming. Agricultural designated uses are referenced in the SWQS policies. Information for data sources is provided in Appendix II.

**Data Requirements for Agricultural Water Supply Designated Use Assessment**

The specific data requirements for assessment of agricultural water supply designated use are described in Section 3: General Data Requirements and assessment of conventionals in surface waters in Section 4.1.

**Agricultural Water Supply Designated Use Assessment Method**

This assessment (see Table 5.16) applies to waters classified as FW2 and PL in the NJ SWQS. Waters classified as FW1, tidal (saline) and DRBC waters are not included. Although the SWQS are applicable to agriculture, numeric criteria specific to agricultural designated use are not included. The water quality suitable for agriculture is normally less stringent than needed to protect aquatic life and human health. In order to evaluate water supplies that support agriculture in New Jersey, guidelines are referenced from the U.S. Department of Interior Natural Resources Conservation and other states (Follet, 1999 and Bauder, 1998). These guidelines are used to evaluate whether water supplies support common agricultural uses such as irrigation and livestock.

For the assessment, total dissolved solids (TDS) and salinity were selected as indicators of agricultural use. Salinity was chosen due to its adverse and immediate detrimental effects on all agricultural practices. TDS has similar negative effects and also indicates possible contamination from runoff. The lower of the recommended standards for irrigation and livestock is applied in the assessment as the acceptable level to fully support agricultural use. Acceptable levels for total dissolved solids and salinity were established as at or below 2,000 mg/l (Follet, 1999). If TDS or salinity data are not available, specific conductance is used as a surrogate with a specific conductance of 3,000 us/cm approximately equivalent to TDS and salinity levels of 2,000 mg/l (United Nations, 1985).

Note: Crops and livestock may be negatively affected by numerous non-water factors such as type of livestock, crop tolerance, soil type, drainage, irrigation methods and management. Therefore exceedences of these guidelines does not necessarily impair uses for agriculture. On the other hand, concentrations below these limits may restrict agricultural use in certain circumstances. Therefore, the designated use assessment of “non attainment” is applied only when a water supply no longer supports existing agricultural uses.

**Table 5.16: Agricultural Designated Use Assessment Method for Rivers and Streams**

<b>Assessment</b>	<b>Result</b>
<b>Water Quality Assessment for 10 or More Samples in 5 Years</b>	
TDS greater than 2000 mg/l or Salinity greater than 2000 mg/l in 10 % or less of samples.	Full Attainment
Threatened Waters: Meets full support but degrading water quality trends indicate full support will not be attained in 2 years.	Non Attainment
TDS greater than 2000 mg/l or Salinity greater than 2000 mg/l in more than 10% of samples.	Non Attainment
Termination of use as an agricultural supply.	Non Attainment
<b>Water Quality Assessment for 4-9 Samples in 5 Years</b>	
TDS less than 2000 mg/l or Salinity less than 2000 mg/l in all samples	Full Attainment
TDS greater than 2000 mg/l or Salinity greater than 2000 mg/l in two (2) or more samples	Non Attainment
TDS greater than 2000 mg/l or Salinity greater than 2000 mg/l in one (1) sample or fewer than 4 samples.	Insufficient Data

## 6.0 Spatial Extent for Assessments

EPA guidance (USEPA 2002) recommends that each assessment of collected sampling data be applied to a waterbody with a specific spatial extent (e.g., stream miles, lake, estuary and ocean acres). The spatial extent is a representation of a waterbody associated with a sampling site. For example, the sampling site, 01403300, is located on the Raritan River at Queens Bridge in Bound Brook. The spatial extent for this site is calculated as 5 miles upstream and 4 miles downstream of the sampling site on the Raritan River. This stretch of river represents the assessment results from the sampling site; in other words, spatial extent is associating a single sampling point to a waterbody such as river stretches and applying the assessment results to this waterbody. With this technique, the Department has the capability to apply assessment data to many uses including the ability to observe which waterbodies in the state meet designated uses, do not meet designated uses, or has insufficient data to make an assessment.

Furthermore, EPA recommends that assessment results should be coded to waterbody segments using either Reach File 3 (RF3), the new National Hydrography Database (NHD), or polygon coverages depicting large waterbodies such as lakes and estuary waters. RF3 and NHD contain segment codes that provide a waterbody address and segment length for streams, lakeshores and coastlines. Lakes, estuary, and ocean waters are depicted as polygon areas using coverages created by NJDEP and also provide waterbody names and area sizes. NJDEP will use RF3 in the 2002 Integrated Report to represent rivers and streams because corrections to this coverage were already underway. However future Integrated Report spatial assessments will use NHD coverages.

### 6.1 Spatial Extent Method for Streams

NJDEP and USGS developed this spatial extent method for benthic macroinvertebrate assessments, conventional water quality parameters, and toxics assessments for all streams in the state. The goal of this spatial extent method is to maximize the use of monitoring data without overestimating spatial extent.

Estimation of spatial extent is largely based on hydrology using the widely accepted Strahler stream order system. Strahler defines headwaters with no tributaries as a “1st order stream”. A “2<sup>nd</sup> order stream” is formed when two 1st order streams converge. Stream order changes when two or more streams with the same stream order converge. Two 2<sup>nd</sup> order streams converge to create a 3<sup>rd</sup> order stream. Stream order does not change if a lower order stream converges with a higher order stream. If 2<sup>nd</sup> or 3<sup>rd</sup> order streams converge with a 4<sup>th</sup> order stream, the 4<sup>th</sup> order stream continues until it converges with a 4<sup>th</sup> order or higher stream. Strahler stream order is depicted on Figure 3.

Generally, Strahler stream order increases with flow and watershed size and indicates when flow from incoming tributaries is likely to be significant enough to change water quality. Strahler stream order, size of the watershed draining to the monitoring site, land use/land cover, impoundments, and station type (for stations in the redesigned ASMN) were used to determine the upstream and downstream extent of monitoring.

- Monitored Waters: are reaches immediately adjacent to the monitoring site and will be used in assessment for sublists 1 through 5 given the higher degree of confidence in the assessment results.
- Estimated waters: are extrapolated from monitored waters based on land use and will be used for sublist 3 only, given the lower degree of confidence.
- Unassessed waters: are waters that can not be evaluated with available data.

### 6.1.1 Spatial Extent of Ambient Biological Monitoring Network Stations

The Ambient Biological Monitoring Network (AMNET) is described in Appendix II. Since local factors are likely to have a significant influence on aquatic biology the spatial extent for each of these monitoring sites is limited in range. However the 800(+) stations in this network provide for excellent overall spatial coverage of the state.

Spatial extent of AMNET monitoring-sites considers the stream order of the reach on which the monitoring site is located; the presence of lakes greater than 25 acres; and if needed, land use/land cover information. Given the significance of local influences tributaries are not assessed except in small watersheds (e.g., watersheds of 2<sup>nd</sup> order or smaller streams). The close proximity of AMNET stations (typically 3 to 5 miles apart) also provide an opportunity to assess stream segments between monitoring sites that have the same assessment result. The method for estimating spatial extent of AMNET stations is described below:

- Monitoring Site on a 2<sup>nd</sup> Order Stream or Smaller: *Upstream* of the monitoring site, all streams are monitored (i.e. mainstem and tributaries in the watershed). *Downstream*, the spatial extent continues along the mainstem to the next 2<sup>nd</sup> order stream or higher stream or an impoundment at least 25 acres.
- Monitoring Site on 3<sup>rd</sup> Order River: *Upstream and downstream* of the monitoring site, the spatial extent continues along the mainstem until there is a confluence with a 2<sup>nd</sup> order or higher stream or an impoundment at least 25 acres (tributaries are not assessed).
- Monitoring Site on 4<sup>th</sup> Order River: *Upstream and downstream* of the monitoring site, the spatial extent continues along the mainstem until there is a confluence with a 3<sup>rd</sup> order or higher stream or an impoundment at least 25 acres (tributaries are not assessed).
- Monitoring Site on 5<sup>th</sup> Order or Larger River: *Upstream and downstream* of the monitoring site, the spatial extent continues along the mainstem until there is a confluence with a tributary that is two stream orders smaller or higher than the mainstem stream or an impoundment at least 25 acres. This mainstem is classified as monitored; the tributaries to this reach are not assessed. Thus, if the monitoring site is located on a 5<sup>th</sup> order stream, the spatial extent continues upstream and downstream to the confluences with 3<sup>rd</sup> order or higher streams.
- Estimated River Assessments: Assessments for estimated rivers were used for the following two scenarios which are shown on Figure 7. If two adjacent monitored reaches had the same assessment result and similar land uses, then the assessment was extended to close small gaps. If two or more monitored reaches with the same assessment result joined at a confluence and had similar land uses, then the assessment was extended below the confluence to the next tributary.

### 6.1.2 Spatial Extent of Ambient Stream Monitoring Network Stations

The following method was developed to estimate spatial extent of the Ambient Stream Monitoring Network (ASMN), which is described in detail in Appendix II. The redesigned ASMN includes 4 monitoring station types selected for a specific purpose: 1.) background, 2.) land use indicator, 3.) watershed integrator, and 4.) Statewide status. This spatial assessment is tailored to each type of monitoring station type.

This method is used to estimate the spatial extent of stations sampling conventional water quality parameters and toxics. The spatial extent of monitoring sites considers: 1.) stream order of the reach on which the monitoring site is located; 2.) presence of impoundments greater than 50 acres; and 3.) surrounding land use/land cover. The maximum length of assessed river reaches is 25 miles based on USEPA guidance.

The Strahler stream order of the tributaries to the monitored reach and the size of the tributary watersheds are considered to estimate the upstream and downstream spatial extent. In general, the spatial extent is terminated at the confluence of a tributary that is at least one stream order lower than the monitoring site, or equal to or a higher stream order than the monitoring site. Lakes greater than 50 acres may have significantly different water quality above and below the lake, therefore, if a river reach is “monitored” the assessment continues as “estimated” above the lake. If the river reach is “estimated” the assessment ends at the lake.

Water quality in streams within a dominant land use watershed is considered to be similar to the monitoring station, providing an opportunity to assess longer stream reaches per monitoring station. If one land use in a watershed above a monitoring site is present in 50% or more of the watershed then that land use is considered dominant. If no single land use accounts for 50% of the watershed the land use is considered mixed. Land use/land cover (LU/LC) is estimated using 1995-97 data grouped into urban, agricultural, and undeveloped (forest plus wetlands). Because changes in water quality may be associated with changes in land use, LU/LC is used (as necessary) to shorten long reaches. For example, the spatial extent of assessment for the Musconetcong River is shortened because land use changes from undeveloped land in the upper portion of the watershed to agricultural in the lower portion.

The general method to estimate spatial extent of assessment for conventional water quality parameters and toxics is described below. The spatial extent of sampling sites from monitoring networks other than the NJDEP/USGS ASMN are estimated using the same method for statewide status sites.

All Stations on a 3<sup>rd</sup> Order or Smaller River: *Upstream* of the monitoring site, all streams are classified as monitored i.e. mainstem and tributaries in the watershed. *Downstream*, the spatial extent continues along the mainstem to the next 2<sup>nd</sup> order stream or higher stream or an impoundment at least 50 acres.

Land Use Indicator Station on a 4<sup>th</sup> Order or Larger River:

A. Dominant Land Use: If the watershed draining to Land Use Indicator (LUI) station has one dominant land use: *Upstream* of the monitoring site, the spatial extent of the assessment continues along the entire mainstem. The mainstem is classified as monitored and tributaries are estimated. *Downstream*, the monitored spatial extent continues along the mainstem until there is a confluence with a tributary that is one stream order smaller or higher than the mainstem stream or an impoundment at least 50 acres. See Figure 5.

B. Mixed Land Use: If the watershed draining to the LUI station has mixed land use: *Upstream* of the monitoring site, the entire mainstem is monitored but tributaries are not assessed. *Downstream*, the monitored spatial extent continues along the mainstem until there is a confluence with a tributary that is one stream order smaller or higher than the mainstem stream or an impoundment at least 50 acres.

Watershed Integrator Station on a 4<sup>th</sup> Order or Larger River: These stations are located at the outlets of large watersheds and have mixed land use. *Upstream* of the monitoring site, the mainstem is

classified as monitored until there is a confluence with a tributary that is one stream order smaller or higher than the mainstem stream or an impoundment at least 50 acres. The spatial extent is classified as estimated from this point until there is a confluence with a tributary that is two stream orders smaller or higher than the mainstem stream or an impoundment at least 50 acres. *Downstream* of the monitoring site, the monitored spatial extent continues along the mainstem until there is a confluence with a tributary that is one stream order smaller or higher than the mainstem stream or an impoundment at least 50 acres. Tributaries to the monitored and estimated reach are not assessed.

#### Statewide Status Stations on a 4<sup>th</sup> Order or Larger River:

- A. Dominant Land Use: If the watershed draining to the Statewide Status station has one dominant land use: *Upstream* of the monitoring site, the entire mainstem is classified as monitored. *Downstream* the monitored spatial extent continues along the mainstem until there is a confluence with a tributary that is one stream order smaller or higher than the mainstem stream or an impoundment at least 50 acres. Tributaries are not assessed.
- B. Mixed Land Use: If the watershed draining to the monitoring site has mixed land use: *Upstream* of the monitoring site, the mainstem is classified as monitored until there is a confluence with a tributary that is one stream order smaller or higher than the mainstem or an impoundment at least 50 acres. *Downstream* of the monitoring site, the monitored spatial extent continues along the mainstem until there is a confluence with a tributary that is one stream order smaller or higher than the mainstem stream or an impoundment at least 50 acres. Tributaries are not assessed. See Figure 6.

### **6.2 Spatial Extent Method for Lakes**

Lakes are assessed as one waterbody and are not subdivided. Each waterbody is identified by a unique name and assigned one assessment result. If several sites are sampled in a lake with individual evaluation results, the assessment result for the lake is the aggregation of all of the sampled site results. For example, there may be several lake beaches with some assessment results being 'Full Attainment' and others "Non Attainment." The final assessment for the lake would be partially supporting recreational lake beaches which is a "Non Attainment" result.

### **6.3 Spatial Extent Method for Estuary Waters**

Estuary waters include all tidal waters except ocean areas and tidal rivers. Spatial extent for ocean waters is explained in Section 6.4, and tidal rivers use the same spatial extent method for streams, Section 6.1. The spatial extent for estuarine waters is based largely on identifying waterbodies and patterns of sample site results. First, the estuaries are identified by unique names to identify separate waterbodies (e.g., Great Bay, Barnegat Bay, Raritan Bay, Little Egg Harbor, etc.). These waterbodies are then subdivided into smaller areas by patterns of sample site results. For biological, recreational, and conventional spatial extents, the monitored estuarine waters are delineated by identifying regional patterns through clusters of sites that are either in full attainment or non-attainment. Open waterbodies with isolated sites in violation are not assigned spatial extents instead the cluster of sites that most accurately represents the water quality pattern will be assigned the spatial extent of the waterbody. For example, a bay has 10 sampling sites located throughout the waterbody. If only two sites are not attaining and the remaining sites are attaining then the regional pattern in the bay is fully attaining. Isolated sites are defined as one or two sites surrounded by sites with different assessments that isolate the site or small pocket of sites. These isolated sites will not be assigned their own spatial extent instead the waterbody will represent the assessment results from the majority of the sampling sites (See Figure 1). If clusters of similar assessment results are identified then each cluster is assigned a spatial extent (See Figure 2). The assessment and



delineation of shellfish waters determined by water quality is performed by NJDEP's Bureau of Marine Water Monitoring.

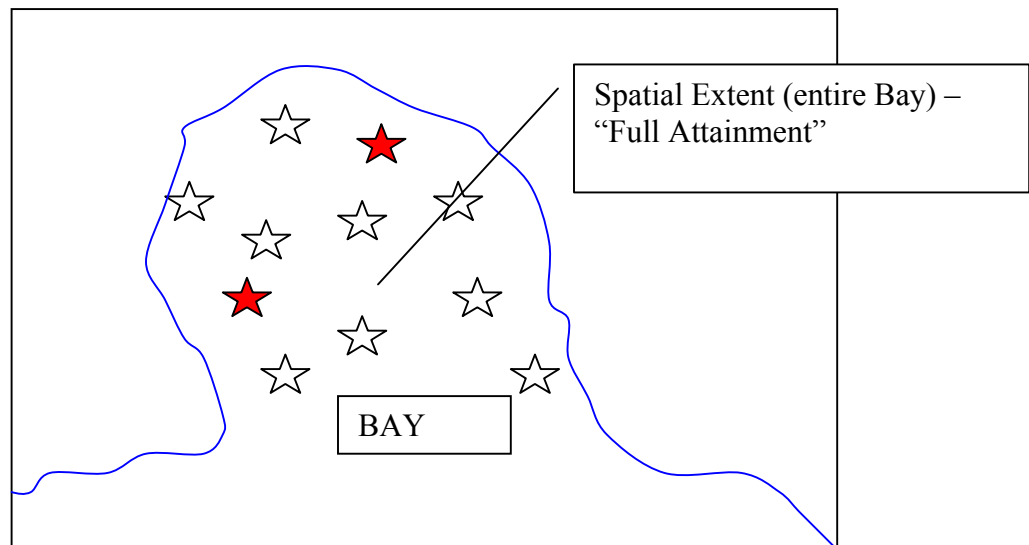


Figure 2. Spatial extent is the entire bay with a “Full Attainment” result. Dark stars are sampling sites with “Non Attainment” results, Open stars have “Full Attainment” results.

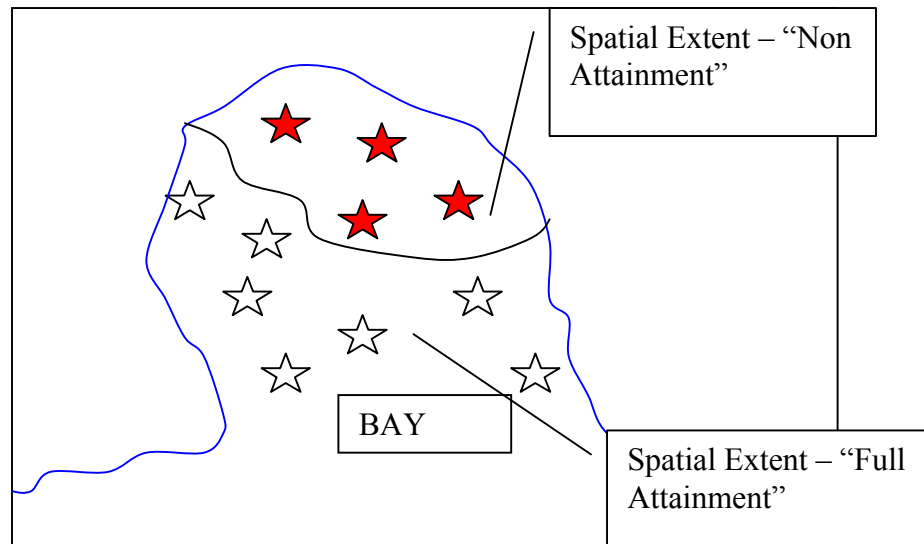


Figure 3. Clusters of sampling sites have different assessments. Bay divided into two spatial extents.

Dark stars are sampling sites with “Non Attainment” results, Open stars have “Full Attainment” results.

#### 6.4 Spatial Extent Method for Ocean Waters

New Jersey jurisdictional waters extend from the shoreline to 3 nautical miles off the coast and from the tip of Sandy Hook to Cape May Point. Spatial extent of assessment is developed in 2 phases. First the USEPA helicopter transects delineate by subdividing the ocean waters so that each USEPA monitoring site is assigned a quadrant with each site centrally located. These quadrants cover all the near ocean waters.

The second phase overlies the monitoring sites maintained by NJDEP which are usually located around ocean outfall pipes and large bay inlets. Portions of the original quadrants, explained above, closest to the coast are then subdivided into near-shore regions characterized by NJDEP sites and far-shore regions characterized by USEPA sites. If the EPA site indicates non-attainment then the entire quadrant is assigned non-attainment. If the EPA site indicates full attainment but the NJDEP data indicates non-attainment then the miles for non-attainment should be assigned to the polygon characterized by the NJDEP site only. The reason for this lies in that the EPA network focuses on benthic anoxia which is very extensive along the NJ coast at certain times of the year. The DEP sites in contrast, characterize surface anoxia, which appears to be much less extensive spatially.

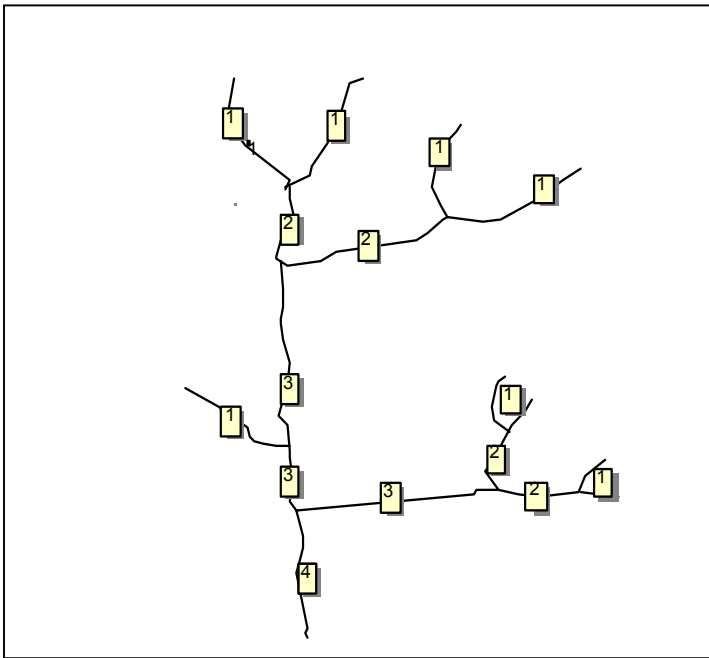


Figure 4. Strahler Stream Order. (Boxes indicate stream order).

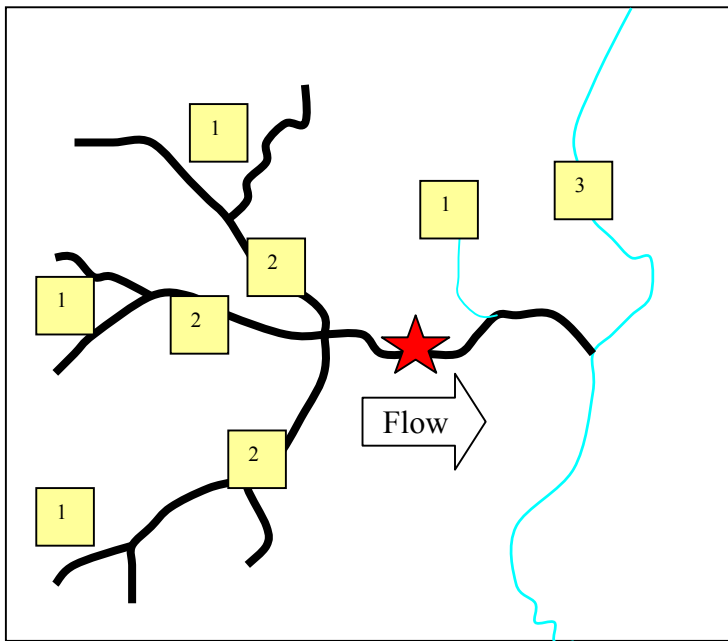


Figure 5. Spatial extent of a chemical monitoring site located on a 3<sup>rd</sup> order stream. Dark rivers are monitored while lighter rivers are not monitored. Boxes indicate stream order. Star represents sampling station.

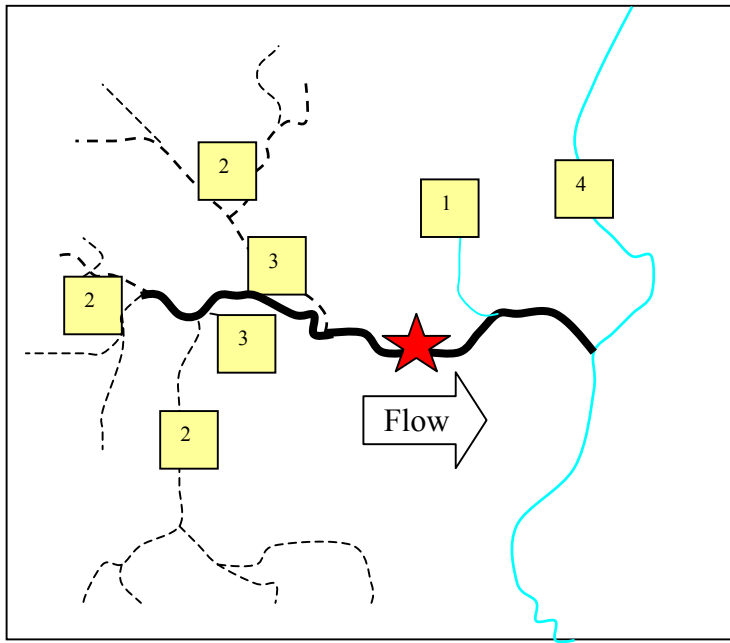


Figure 5. Spatial extent of a monitoring site (land use indicator in dominant land use) located on a 4<sup>th</sup> order stream. Heavy dark lines are monitored, dashed dark lines estimated, and light lines are not monitored. Boxes indicate stream order, Star represents sampling station.

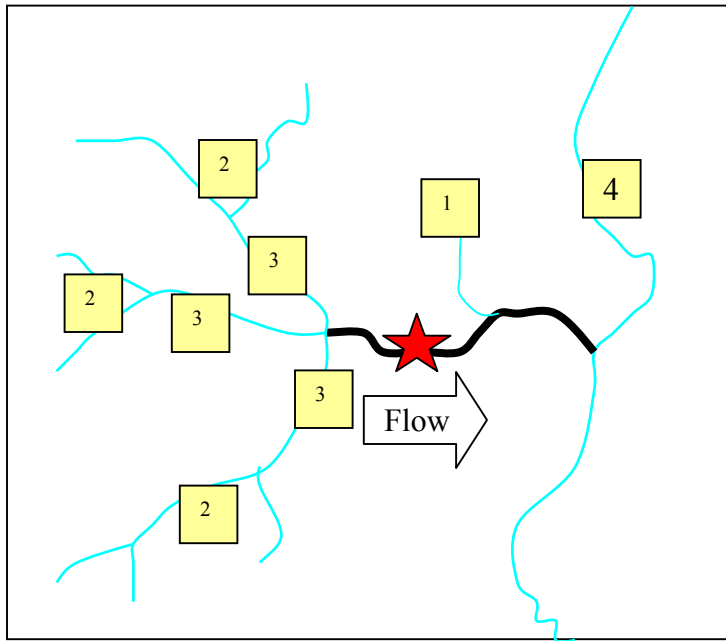


Figure 6. Spatial extent of a monitoring site (statewide status in mixed land use) located on a 4<sup>th</sup> order stream. Dark rivers are monitored while lighter rivers are not monitored. Boxes indicate stream order. Star represents sampling station.

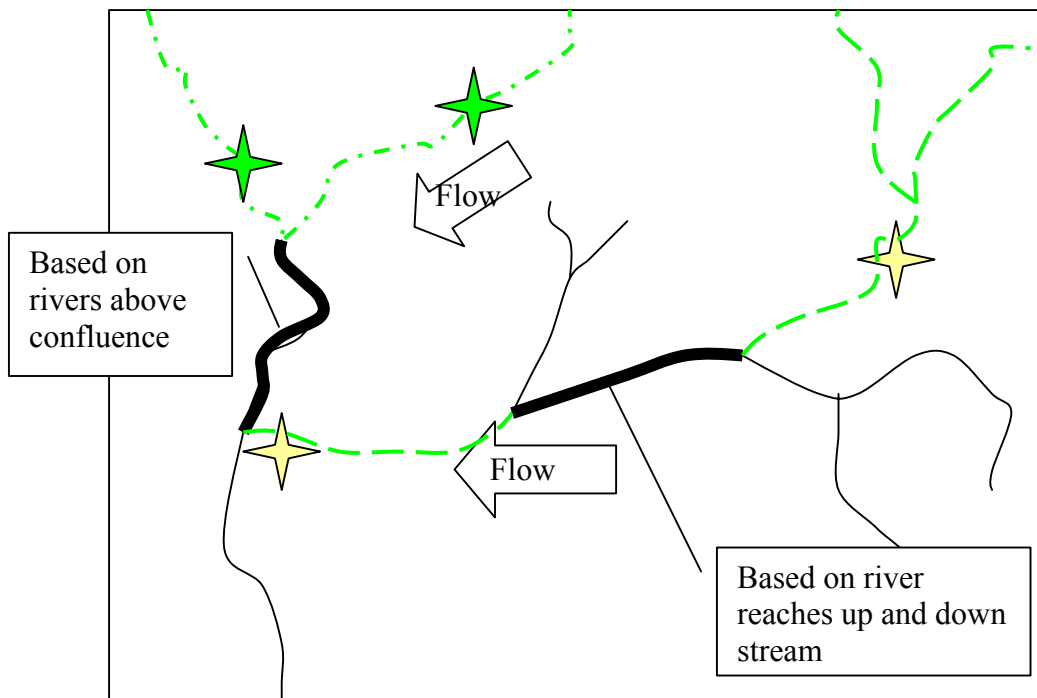


Figure 7. Example of estimated river reach based on biological monitoring sites. Large, dark lines represent estimated river reaches. Stars represent biological monitoring sites with dark stars = "Full Attainment" and light stars = "Non Attainment." Dashed lines represent monitored river reaches. Small, dark lines represent non assessed river reaches.

## 7.0 Integrated Listing Guidance Method

The USEPA Guidance for developing Integrated Reports (USEPA 2001) of water quality and listings of impaired water segments recommends placing the assessment results into one of five specific categories. USEPA's Guidance, which has been included in this document in its entirety as Appendix I, defines the five categories in which a waterbody may be placed. Briefly, those categories are:

Category 1: Attaining a water quality standard and no use is threatened.

Category 2: Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened. ‘

Category 3: Insufficient or no data and information to determine if any designated use is attained.

Category 4: Impaired or threatened for one or more designated uses but does not require the development of a TMDL. (Three Categories)

A. TMDL has been completed.

B. Other enforceable pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.

C. Impairment is not caused by a pollutant.

Category 5: The water quality standard is not attained. The waterbody is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL.)

For additional details, refer to Appendix I.

## 7.1 Integrated Listing Methodology

The Department had considered using EPA's categories as outlined in their guidance. This would have listed each waterbody only once according to the waterbody's worst assessment. As noted in the Introduction, under USEPA guidance (USEPA, 2001), a waterbody can be included in only one of the 5 categories (i.e., the category that conveys the highest degree of impairment) as a result of the integrated assessment. Thus, if a waterbody meets all applicable surface water quality standards except fecal coliform, the waterbody would be included only in Category 5 - "*Water quality standard is not attained and a TMDL is required*" - until the fecal coliform TMDL is completed, even though all other water quality standards are met. Since this approach may result in an overly negative view of water quality, the Department has chosen to develop the Integrated List by waterbody/parameter combinations, not just by waterbody. This will enable the Department to present each parameter for each waterbody in the appropriate category. This results in the possibility of a waterbody being placed on multiple sublists. This also has resulted in the elimination of sublist 2 since a waterbody/parameter is placed either on sublist 1 (full attainment) or sublist 3 (insufficient data).

The Department has also chosen to deviate from the USEPA guidance and use the term "sublist" rather than "category" when referring to the 5 parts of the Integrated List to eliminate confusion between the Category 1 of the Integrated List and Category 1 waters under Surface Water Quality Standards (SWQS).

The Integrated Listing Method provided in Table 7.1 describes how the results of the individual assessments described in Sections 4 and 5 will be integrated to determine the listing assignment for each waterbody/parameter combination. The following are important considerations associated with the Integrated Listing Method:

- Waterbodies classified as "non attainment" due to impairment or threat of impairment by one or more pollutants may be reclassified to another sublist without completing a TMDL if additional

data and information indicating this classification was inappropriate becomes available by the next listing cycle.

- Results of studies conducted to further evaluate relationships between designated use attainment, policies, and applicable criteria may be used to develop site-specific or watershed-specific criteria, clarify designated uses or reclassify waterbodies to another sublist without completing a TMDL. For example, studies to evaluate relationships between designated uses, nutrient policies and total phosphorus criteria are anticipated in some waterbodies that do not meet the numerical criterion.
- ◆ USEPA guidance (USEPA, 2001) requires a TMDL only when the cause of the impairment is a pollutant (see Sublist 5). If the impairment is caused by pollution and not a pollutant, the waterbody will be placed in Sublist 4. Pollutant is defined in the CWA as “spoil, solid waste, incinerator residue, sewerage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water”. Pollution is defined as “the man-made or man-induced alteration of the chemical, physical, and radiological integrity of a waterbody”.

**Table 7.1: Integrated Listing Method**

<b>Assessment</b>	<b>Integrated Assessment</b>	<b>Sublist</b>
Full Attainment	SWQS criteria or designated use assessment is complete and results for the assessment indicated Full Attainment.	<b>Sublist 1:</b> Attaining SWQS
Insufficient Data	Results of SWQS criteria and designated use assessments indicated “Insufficient Data”	<b>Sublist 3:</b> Insufficient or no data and information to determine if designated use or SWQ criteria is attained.
Non Attainment	SWQS criteria or designated use assessment is complete and results for the assessment indicated Non-Attainment or threatened for a pollutant.	<b>Sublist 4a:</b> TMDL adopted in New Jersey Register and approved by USEPA <b>Sublist 5:</b> The water quality standard or designated use is not attained or is threatened and requires a TMDL
Non Attainment	Non Attainment due to pollutants, other strategies being used to restore attainment status.(i.e. watershed management, non-point source controls, lake restoration plan, permitting, enforcement, finance, site remediation and other relevant water quality improvement projects)	<b>Sublist 4b:</b> Document water quality improvement strategies and expected time frame of SWQS attainment
Non Attainment	Non Attainment due to pollution, including impoundments, flow alterations, habitat degradation or the cause is unknown	<b>Sublist 4c:</b> The cause of impairment could reasonably be determined and was attributed solely to pollution.
Non Attainment	The cause of impairment (pollution/pollutant) could not reasonably be determined.	<b>Sublist 5:</b> Additional studies will be done to determine the cause of impairment.

## **7.2 Determining Causes and Sources of Impairment**

In making 305(b) water quality/use support assessments, the primary focus is the evaluation of existing data and information. Some of that information may include knowledge of conditions known or likely to cause impairment. Many times, however, ambient data, especially biological data, may indicate an impairment but the cause and source are unknown. In other cases, monitoring staff may have knowledge of particular discharges or land use conditions that could potentially cause impairment, but do not have the specific information or resources to conduct a thorough investigative study to verify causes and sources. Therefore, for the vast majority of impaired waters listed in the Integrated Report, the causes and sources indicated are the best estimations of staff. Once a waterbody or segment is designated for TMDL development, however, a more thorough investigative study will be conducted to determine possible causes and sources of impairment. These investigations may include more intensive ambient water quality sampling, aquatic toxicity studies, sediment or fish tissue analysis and/or dilution calculations of known discharges. In some cases the determination of causes and sources may not be possible

## **7.3 Delisting**

For waters listed on previous 303(d) Lists, there are several possible scenarios that may result in a waterbody being removed from a 303(d) list (Sublist 5). Some scenarios that could result in the removal of a waterbody from sublist 5 follow:

1. A determination is made that the waterbody is meeting water quality standards (i.e., no TMDL is required). For example:
  - A. An error was made in the initial listing causing an erroneous listing;
  - B. New Information: More recent and/or more accurate data which meets the QA/QC requirements identified in Section 3.2 of this Methods Document demonstrates that a designated uses or SWQ criteria are being met for the waterbody (with or without a TMDL);
  - C. Revisions to the SWQs may cause a waterbody to come into compliance with standards or no water quality standard exists.
2. Reassessment of available information or data: Waterbody listed on previous 303d list is based on data, which is insufficient to meet current data quality requirements. Some examples:
  - A. New Macro-Invertebrate Protocol: Macroinvertebrate data had been collected under conditions not calibrated to reference conditions specified in the sampling protocol. See Section 5.1.2 and Table 5.3 for detailed information
  - B. Criterion not measurable.
  - C. Sufficient data not available (i.e. frequency, number of samples or QA/QC requirements not met).
3. TMDL has been completed. A waterbody will be removed from Sublist 5 and placed in Sublist 4A once a TMDL, which is expected to result in full attainment of the SWQS, has been developed and approved by EPA.
4. Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future. These requirements must be specifically applicable to



the particular water quality problem. This includes the installation of new control equipment or elimination of discharges.

5. Impairment is not caused by a pollutant.
6. New spatial extent – When sufficient data warrants, waterbodies previously listed on a large scale may be broken down into smaller assessment units and placed in other sublists, if appropriate. Waterbodies listed based on 304(l) listings and previously identified by RF1 segments will be identified by the station causing the original listing when station information is available.
7. Natural causes - Waters that exceed standards but drain wilderness or similar areas and it can be documented that there are no contributing human contributions that could contribute to the standard exceedence.

## 8.0 Method to Rank and Prioritize Impaired Waterbodies

Section 303(d) of the Federal Clean Water Act requires states to rank and prioritize impaired waterbodies (i.e., waterbodies in Sublist 5). The goal of priority ranking is to focus available resources on the right waterbodies at the right time, in the most effective and efficient manner, while taking into account environmental, social and political factors. The Department will prioritize those parameters identified in Sublist 5 dependent upon the nature of the pollutant of concern. Pollutants that relate directly to human health issues rank “high”, while more conventional water quality parameters rank “medium” and aquatic life considerations rank “low”. The Department believes that pollutants which acutely or chronically effect human health are of a higher priority than those which may alter aquatic life in perhaps an unknown casual and effectual relationship. Table 8.1 below lists the parameters of concern and their relative ranking.

**Table 8.1: Criteria for Ranking Waterbodies by Pollutants of Concern**

<b>Pollutant of Concern</b>	<b>Priority</b>	<b>Reason for Priority</b>
Fecal Coliform in streams	High	Hard to regulate/control primary and secondary contact.
Metals, Toxics and Organics	High	Direct human health criteria.
Nitrate	High	Direct human health drinking water issue.
Phosphorous, pH, Dissolved Oxygen, temperature, total dissolved solids, total suspended solids, unionized ammonia	Medium	No direct human health issue but may have indirect effect on human health. Important aquatic life issue.
Fecal Coliform in lakes	Low	Either associated with bathing beaches, at which there are extensive controls in place (monitoring/beach closings) or at non-bathing beaches where recreational activities are more controllable than in streams.
Listings for Shellfish	Low	Managed by NSSP classifications.
Macroinvertebrates, Eutrophic Lakes, Aquatic Life	Low	Not directly related to human health issues, but are of an environmental importance.

There is a difference, however, between ranking for priority and implementing a TMDL development schedule. Some “low priority” listings may require less TMDL effort and therefore the management response can be completed sooner than “high” priority listings associated with more complex TMDLs, which will take substantial amount of time and effort to complete. An example of such a difference in priority listing and TMDL schedule is in the New York/New Jersey Harbor Estuary, where the listings are high, but the priority to do TMDLs is low. That is not to state that TMDLs in the Harbor will not be done, when in fact the Department has already begun the TMDL processes, but the TMDL is a multi-year, multi-agency effort, unlike, for example a fecal coliform listing on a small headwater stream in in-state New Jersey. Therefore, the priority ranking will drive when

TMDLs are initiated but may not directly translate into when the TMDLs are scheduled to be completed.

The Department will prioritize those waterbodies in Sublist 5 for TMDL development within the next two years, taking into an equal account, at a minimum, the following factors:

- ◆ TMDL complexity
- ◆ Pollutants of concern and identification of legacy pollutants of concern
- ◆ Additional data and information collection needs
- ◆ Sources of the pollutants, e.g. atmospheric deposition and acid rain
- ◆ Severity of the impairment or threatened impairment
- ◆ Spatial extent of impairment
- ◆ Designated uses of the waterbodies
- ◆ Efficiencies of grouping TMDLs for waterbodies located in the same watershed or for the same parameter of concern
- ◆ Timing of downstream TMDLs developed by other agencies, e.g. New York / New Jersey Harbor Estuary Program
- ◆ Status of TMDL project development at the time of ranking priorities (TMDL development already underway)
- ◆ Timing of TMDLs for shared waterbodies with the State of New York
- ◆ General watershed management activities, e.g. 319 grant activities and watershed management planning
- ◆ Other ongoing control actions that will result in the attainment of SWQS, e.g. site remediation activities
- ◆ Existence of endangered and sensitive aquatic species
- ◆ Recreational, economic, cultural, historic and aesthetic importance
- ◆ Degree of public interest and support for particular waterbodies"

The Department will develop either TMDLs or other appropriate responses on the waterbodies listed in Appendix II within the next two years, i.e. by Year 2004. That list includes a combination of "high" and "low" impaired waterbodies. This approach allows the Department to address waterbodies once for appropriate management responses if it is listed for more than one pollutant of concern at different priority listings, instead of revisiting the waterbody up to three times, once each for high, medium and low parameters. Also, the Department has already begun the TMDL process in all of those waterbodies in Appendix II.

## **9.0 Method for Developing the Monitoring and Assessment Plan**

The Integrated Report guidance (USEPA 2002) states that the States should include: 1.) description of additional monitoring that may be needed to determine water quality standard attainment status and, if necessary, to support development of TMDLs for each pollutant/waterbody combination; and 2.) schedule for additional monitoring planned for waterbodies.

Consistent with Section 106(e)(1) of the CWA, the 2002 Integrated Report will include a comprehensive Monitoring and Assessment Plan that describes the state's approach to obtaining data and information necessary to characterize the attainment status of all assessment units. Elements of this strategy include: a description of the sampling approach (i.e. rotating basin, fixed and probabilistic station array), a list of the parameters to be collected (i.e. physical, chemical, and biological), an approach to assess the data with respect to SWQS and spatial extent. The 2002 Integrated Report will include a schedule (both long term and annually) for collecting data and information for basic assessments and for TMDLs.

It is neither necessary nor practical to conduct site-specific monitoring of all waters to support comprehensive assessments. Various approaches will be employed to prioritize and target collection of new water quality data, assess extant data from available sources and use advanced assessment tools such as spatial statistics, probabilistic monitoring and modeling to estimate water quality. Assessment of data is an important component of the Monitoring and Assessment Plan. Assessments may include the following:

- Comparing site-specific data to applicable SWQS;
- Estimating the spatial extent of monitoring;
- Conducting trends analyses or other statistical methods to evaluate changes in water quality over time and predict future water quality changes (i.e., threats to water quality);
- Identifying causes of impairment, particularly biological impairment; and
- Estimating the effectiveness of water quality improvement strategies (i.e., pollutant load reductions, flow alterations, TMDL implementation).

The schedule associated with the monitoring and assessment plan will consider the following priorities:

- TMDL planning and development;
- Identifying causes of impairment for waterbodies on Sublist 5;
- Identifying waterbodies that may be impaired by pollutants and require TMDLs;
- Monitoring and assessments for waterbodies that currently have no data or insufficient data. Monitoring and assessments may be prioritized based on existing uses (potable supply, recreational contact, aquatic life); and
- Continuing routine monitoring for waterbodies that are currently assessed.

It is important to recognize that monitoring and assessing each waterbody will require significant effort and can only be accomplished over the long term. Several strategies will be key to accomplishing this goal including:

- Using of advanced statistical techniques to evaluate water quality in waterbodies that are not sampled based on probabilistic sampling;
- Exchanging and using data and assessments from other programs within NJDEP and watershed partners;
- Expanding ongoing and planned monitoring and assessments to address data limitations identified for waterbodies on Sublists 2 and 3.

## **10.0 Public Participation**

The Integrated Report will combine the non-regulatory Water Quality Inventory Report (305b) aspects with the more regulation-driven aspects of the Impaired Waterbodies (303d) listing procedures (i.e., only the latter triggers TMDL development). The public participation requirements of these programs are different. In general, sublist 5 of the Integrated List is considered reporting under Section 303(d) for Impaired Waterbodies and the remaining sublists (1 through 4) are considered reporting under Section 305b for Water Quality Inventory. Therefore, regulatory requirements identified in this section (regarding public participation, EPA approval and adoption of the Impaired Waterbodies List) apply only to sublist 5 waters. The Department is required under 40 CFR 130.7(b)(6) to provide a description of the methodology used to develop the list as part of the 303(d) List. This Methods Document lays out the framework for assessing data and determining which of the 5 sublists the waterbody will be assigned to in fulfillment of that requirement (and will be included with the Integrated List). By doing so, it will follow the same public process as the 303(d) Listing. The entire Integrated List (Sublists 1 through 5) will be provided during the public process for informational purposes only.

### **10.1 Request for Data**

The Department will invite the submittal of data and information for use in developing the Integrated Report. The public notice of the request for data will be published in the New Jersey Register, the DEP Bulletin, and the NJDEP Website. The time period for submitting data will be specified in the public notice and will be a minimum of six months. Data submitted after the specified period will be considered in the development of subsequent Integrated Reports.

### **10.2 Public Notice**

The Department will publish notice of the availability of the Integrated Water Quality Monitoring and Assessment Methods and Draft Integrated Report in the New Jersey Register, the DEP Bulletin, on the NJDEP Website, and in newspapers of general circulation throughout the State. Adjacent states, federal and interstate agencies shall also be notified, as necessary.

The public notice shall include the following:

- A summary of listed waterbody segments and relative parameters;
- A description of the procedures for comment on the draft Methods Document and proposed Sublist 5 List; and
- The name, address and website of the office in the Department from which the Draft Methods Document and Integrated Report may be obtained and to which comments may be submitted.

### **10.3 Comment Period**

The comment period on a proposed Sublist 5 (303(d)) List shall be a minimum of 30 days.

### **10.4 Public Hearings**

Within 30 days of the publication of the notice, interested persons may submit a written request to extend the comment period for up to 30 days. If the Department determines that there is a significant environmental issues or that there is a significant degree of public interest, the comment period shall be extended. If granted, notice of an extension of the comment period shall be published promptly in the DEP Bulletin and on the NJDEP Website.

### **10.5 Final Action**

After the close of the public comment period, the Commissioner shall render a decision on Sublist 5 [303(d) List], which will be the final agency action. The Commissioner may:

1. Adopt Sublist 5 as proposed;
2. Adopt Sublist 5 with changes which do not significantly change the public notice regarding the proposed List; or:
3. Re-propose all or portions of Sublist 5.

When the commissioner has adopted Sublist 5, the Department will public notice the adopted list in the New Jersey Register and submit the adopted list to USEPA for approval in accordance with 40 CFR 130.7.

#### **10.6 Availability of Final Documents**

The Integrated Report, which will include the Integrated List, monitoring needs and schedules, TMDL needs and schedules, as well as, any other information usually included in the 305(b) Report, will be submitted to EPA as required by Section 305(b) of the Clean Water Act. The Department will post the availability of the Integrated Report on its web page at that time.

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## **APPENDICES**

- I. 2002 Integrated Water Quality Monitoring and Assessment Report Guidance
- II. Data Sources for the 2002 New Jersey Integrated Report
- III. Nutrient Criteria Plan (PLACEHOLDER)
- IV. USEPA–USGS–NJDEP Interagency Workgroup Assessment and Listing Methodology for Aquatic Life in Freshwater Streams
- V. USEPA–USGS–NJDEP Interagency Workgroup Assessment and Listing Methodology for Metals
- VI. List of Acronyms and Abbreviations

## Appendix I

### 2002 Integrated Water Quality Monitoring and Assessment Report EPA Guidance

(Available at USEPA website: <http://www.epa.gov/owow/tmdl/2002wqma.html>)

#### MEMORANDUM

**SUBJECT:** 2002 Integrated Water Quality Monitoring and Assessment Report Guidance

**FROM:** Robert H. Wayland III, Director  
Office of Wetlands, Oceans and Watersheds

**TO:** EPA Regional Water Management Directors  
EPA Regional Science and Technology Directors  
State, Territory and Authorized Tribe Water Quality Program Directors

#### Introduction

Clean Water Act (CWA) Section 305(b) reports and Section 303(d) lists are highly visible ways of communicating about the health of the nation's waters. The quality and reliability of the information they contain becomes increasingly important as it is used to set priorities and to implement water quality controls and protection activities. For the first time, the Environmental Protection Agency (EPA) is providing states, territories, and authorized tribes with guidance for integrating the development and submission of 2002 305(b) water quality reports and Section 303(d) lists of impaired waters.

This guidance recommends that states, territories, and authorized tribes submit a *2002 Integrated Water Quality Monitoring and Assessment Report* (hereinafter referred to as the *Integrated Report*) that will satisfy CWA requirements for both Section 305(b) water quality reports and Section 303(d) lists. This *Integrated Report* will show the following information:

- delineation of water quality assessment units (AUs) based on the National Hydrography Dataset (NHD);
- status of and progress toward achieving comprehensive assessments of all waters;
- water quality standard attainment status for every AU;
- basis for the water quality standard attainment determinations for every AU;

- additional monitoring that may be needed to determine water quality standard attainment status and, if necessary, to support development of TMDLs for each pollutant/AU combination;
- schedules for additional monitoring planned for AUs;
- pollutant/AU combinations still requiring TMDLs; and
- TMDL development schedules reflecting the priority ranking of each pollutant/AU combination.

With the exception of the monitoring schedules and the delineation of assessment units (AUs), all of the data and information needed to support the *Integrated Report* was requested in guidance for earlier 305(b) reports and 303(d) lists. The data and information will simply be arrayed in a different manner in the 2002 *Integrated Report*.

Consistent with Section 106(e)(1) of the CWA, each state should develop a comprehensive monitoring and assessment strategy that describes the state's approach to obtaining data and information necessary to characterize the attainment status of all assessment units. Elements of an effective strategy should include: a description of the sampling approach (i.e. rotating basin, fixed or probabilistic station array), a listing of the parameters to be collected (i.e. physical, chemical, and biological), and a schedule (both long term and annually) for collecting data and information (for basic assessments and for TMDLs). The monitoring schedules requested for the 2002 *Integrated Report* should be consistent with the state's or territory's current comprehensive monitoring and assessment strategy.

The National Research Council (NRC) report, "Assessing the TMDL Approach to Water Quality Management," prepared in 2001 for Congress, emphasized the importance of state monitoring programs in supporting effective water quality management actions. The NRC report recommended that states commit to regular and planned monitoring. The request for monitoring schedules in this guidance responds to this specific NRC recommendation.

Today, the majority of the nation's waters remain unmonitored and unassessed. Yet Section 305(b) of the CWA requires that all waters be assessed every two years. It is not necessary or practicable for states and territories to do site-specific monitoring of all waters to be able to make such an assessment of all waters. EPA believes that a probabilistic monitoring design applied over large areas, such as a state or territory, is an excellent approach to producing, with known confidence, a "snapshot" or statistical representation of the extent of waters that may or may not be impaired. A probabilistic monitoring design can assist a state or territory in determining monitoring priorities and in targeting monitoring activities. States and territories are encouraged to use probabilistic designs for water quality assessments and to include reports of these assessments with their *Integrated Reports*. A format for reporting assessments based on probability designs is included in Appendix B.

The *Integrated Report* will enhance the ability of water quality managers to display, access, and integrate environmental data and information from all components of the water quality program (e.g., water quality standards, National Pollutant Discharge Elimination System (NPDES) permits, TMDLs, nonpoint source controls, and monitoring), as well as other media programs such as Superfund, Resource Conservation and Recovery Act (RCRA), and the Clean Air Act programs. This approach will help managers justify, on a watershed basis, resource allocations and future resource requirements. This approach will also allow water quality managers to focus TMDL resources on those waters that are actually impaired by pollutants.

EPA also anticipates that the development of an *Integrated Report* will benefit the public by providing a much clearer summary of the water quality status of the nation's waters and the management actions necessary to protect and restore them. A state or territory should provide the public an opportunity to review and comment on an integrated assessment of the status of all waters within its jurisdiction. This integrated assessment will include monitoring schedules, the assessment and listing methodology, and supporting data and information used to develop the *Integrated Report*.

This guidance updates previous guidance and, to the extent it is different, supercedes previous guidance. The statutory provisions in Sections 303(d) and 305(b) and EPA regulations described in this document contain legally binding requirements. This document does not substitute for those statutory provisions or regulations, nor is it a regulation itself. Thus, it does not impose legally binding requirements on EPA, states, or territories and may not apply to a particular situation based upon the circumstances. EPA, state and territorial decision-makers have the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. EPA may revise this guidance in the future, as appropriate.

This guidance does not, and cannot, change existing rules for listing and delisting. The existing regulations require states, territories, and authorized tribes, at the request of the Regional Administrator, to demonstrate good cause for not including waterbodies on the 303(d) list that were included on previous 303(d) lists (pursuant to 40 C.F.R. 130.7(b)(6)(iv)). Good cause includes, but is not limited to, more recent and accurate data, more sophisticated water quality modeling, flaws in the original analysis that led to the waterbody being listed, or changes in conditions, e.g. new control equipment, or elimination of discharges. Where a waterbody was previously listed based on certain data or information, and the state or territory removes the waterbody without developing or obtaining any new information, EPA will carefully evaluate the state's or territory's re-evaluation of the available information, and will not approve such removals unless the state's or territory's submission describes why it is appropriate under the current regulations to remove each affected waterbody. EPA has the authority to disapprove the list if EPA identifies existing and readily available information, available at the time the state or territory submitted the list that shows a waterbody does not attain water quality standards. See 40 C.F.R. 130.7(b)(6)(iv).

In order to provide states and territories with the necessary time to integrate the requirements of Sections 305(b) and 303(d), EPA has extended the date for the submission of 303(d) lists of AUs still requiring the establishment of a TMDL to October 1, 2002. EPA will not invoke any Section 106 grant conditions pertaining to Section 305(b) reporting until after October 1, 2002. It may be difficult for a few states and territories to adopt the approach outlined in this guidance by October 1, 2002. In such cases, states and territories may choose to follow the existing guidance for Sections 305(b) and 303(d). Submissions following the existing guidance are also due by October 1, 2002. Indian tribes are not required to develop Section 305(b) reports to receive grants under Section 106. See 40 C.F.R. 130.4. [See Federal Register, Oct. 18, 2001, Vol. 66, No. 202, pp. 53044-53048] Accordingly, the provisions of this guidance related to Section 305(b) reports do not pertain to Indian tribes. However, the provisions of the guidance related to Section 303(d) do pertain to tribes authorized by EPA to establish 303(d) lists.

The remaining sections of this memo cover the following seven areas:

Assessment and Listing Methodologies,  
Integrated Lists of Waters and Monitoring Schedules,  
Supporting Data and Information,  
Public Participation,  
Submission to EPA,  
EPA Action on Section 303(d) Lists, and  
Support from EPA Regions and Headquarters.

## **Definitions**

Definitions of terms as used only in this guidance are provided below:

Assessment Unit (AU). A waterbody whose attainment status is reported in the *Integrated Report*. An AU must be named and located based on the National Hydrography Dataset (NHD). Where the state's or territory's spatial resolution is on a finer scale than NHD, EPA will translate that resolution into the NHD system.

Water quality standard (standard). A water quality standard defines the water quality goals of an assessment unit (AU) by designating the use or uses to be made of the AU and by setting criteria, both numeric and narrative, necessary to protect the designated use(s). A water quality standard also includes the associated antidegradation policy as defined in regulation at 130.7(b)(3) and adopted by a state or territory.

Water quality standard is attained. The water quality standard is attained when all designated uses and associated criteria are met as determined in accordance with a state's or territory's assessment and listing methodology.

Water quality standard is threatened. The water quality standard is being attained, but non-attainment is predicted, in accordance with the state's or territory's assessment and listing methodology, by the time the next *Integrated Report* is due.

Water quality standard is not attained (impaired). The water quality standard is not attained in accordance with a state's or territory's assessment and listing methodology.

### **Assessment and Listing Methodologies**

States and territories must provide a description of the assessment and listing methodology used to develop their Section 303(d) lists and Section 305(b) reports. This methodology should include a description of the processes and procedures used to assess the quality of the waters and explain how all existing and readily available data and information was assembled and used to determine the attainment status in each AU, consistent with the applicable water quality standards.

Data and information found in the following documents is existing and readily available data and should be considered as a basis for identifying impaired waters consistent with the state's or territory's water quality standards and assessment and listing methodology:

The Section 305(b) report, including the Section 314 lakes assessment;  
The most recent Section 303(d) list;  
The most recent Section 319(a) nonpoint assessment;  
Reports of water quality problems provided by local, state, territorial or federal agencies, volunteer monitoring networks, members of the public or academic institutions;  
Reports of dilution calculations or predictive models;  
Fish and shellfish advisories, restrictions on water sports or recreational contact;  
Reports of fish kills or abnormalities (cancers, lesions, tumors);  
Water quality management plans;  
Safe Drinking Water Act Section 1453 source water assessments;  
Superfund and Resource Conservation and Recovery Act reports; and  
The most recent Toxic Release Inventory.

### **Integrated Lists of Waters and Monitoring Schedules**

Based on its assessment and listing methodology, each state or territory should report to EPA the water quality standard attainment status of all AUs in their jurisdiction. Each AU should be placed in only one of the five unique assessment sublists. Monitoring needed to support water quality management actions for each AU should be scheduled by year for all sublists. Each sublist and recommended monitoring is described below:

1. **Attaining the water quality standard and no use is threatened.** AUs should be listed in this sublist if there are data and information that meet the requirements of the state's or territory's assessment and listing methodology and support a determination that the water quality standard is attained and no use is threatened. States and territories should consider scheduling these AUs for future monitoring to determine if the water quality standard continues to be attained.
2. **Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened.** AUs should be listed in this sublist if there are data and information, which meet the requirements of the state's or territory's assessment and listing methodology, to support a determination that some, but not all, uses are attained and none are threatened. Attainment status of the remaining uses is unknown because there is insufficient or no data or information. Monitoring should be scheduled for these AUs to determine if the uses previously found to be in attainment remain in attainment, and to determine the attainment status of those uses for which data and information was previously insufficient to make a determination.
3. **Insufficient or no data and information to determine if any designated use is attained.** AUs should be listed in this sublist where the data or information to support an attainment determination for any use is not available, consistent with the requirements of state's or territory's assessment and listing methodology. To assess the attainment status of these AUs, the state or territory should obtain supplementary data and information, or schedule monitoring as needed.
4. **Impaired or threatened for one or more designated uses but does not require the development of a TMDL.**
  - A. **TMDL has been completed.** AUs should be listed in this sublist once all TMDL(s) have been developed and approved by EPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of an AU, the AU will remain in Sublist 5 until all TMDLs for each pollutant have been completed and approved by EPA. Monitoring should be scheduled for these AUs to verify that the water quality standard is met when the water quality management actions needed to achieve all TMDLs are implemented.
  - B. **Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.** Consistent with the regulation under 130.7(b)(i),(ii), and (iii), AUs should be listed in this sublist where other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard (WQS) applicable to such waters. EPA expects that these requirements must be specifically applicable to the particular water quality problem. Monitoring should be scheduled for these AUs to verify that the water quality standard is attained as expected.



- C. **Impairment is not caused by a pollutant.** AUs should be listed in this sublist if the impairment is not caused by a pollutant. States and territories should consider scheduling these AUs for monitoring to confirm that there continues to be no pollutant-caused impairment and to support water quality management actions necessary to address the cause(s) of the impairment.
5. **The water quality standard is not attained. The AU is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL.** This sublist constitutes the Section 303(d) list of waters impaired or threatened by a pollutant(s) for which one or more TMDL(s) are needed. An AU should be listed in this sublist if it is determined, in accordance with the state's or territory's assessment and listing methodology, that a pollutant has caused, is suspected of causing, or is projected to cause an impairment. Where more than one pollutant is associated with the impairment of a single AU, the AU will remain in Sublist 5 until TMDLs for all pollutants have been completed and approved by EPA.

For AUs listed in this sublist, states or territories should provide monitoring schedules that describe when data and information will be collected to support TMDL establishment and to determine if the standard is attained. EPA recommends that while the state or territory is monitoring the AU for a specific pollutant to develop a TMDL, it also monitor the watershed to assess the attainment status of other uses.

A state or territory must submit a schedule for the establishment of TMDLs for all waters in Sublist 5. This schedule must reflect the state's or territory's own priority ranking of the listed waters.

A state or territory assessment and listing methodology should establish how biological monitoring will be used to determine if biological impairment of an AU exists, the cause of the impairment, and the appropriate listing sublist for the AU.

If a state or territory determines that an AU does not meet a use based on biological information, and the impairment is caused or is suspected to be caused by a pollutant(s), the AU should be listed in Sublist 5. If the state or territory believes that the impairment is not caused by a pollutant(s), the AU should be listed in Category 4c.

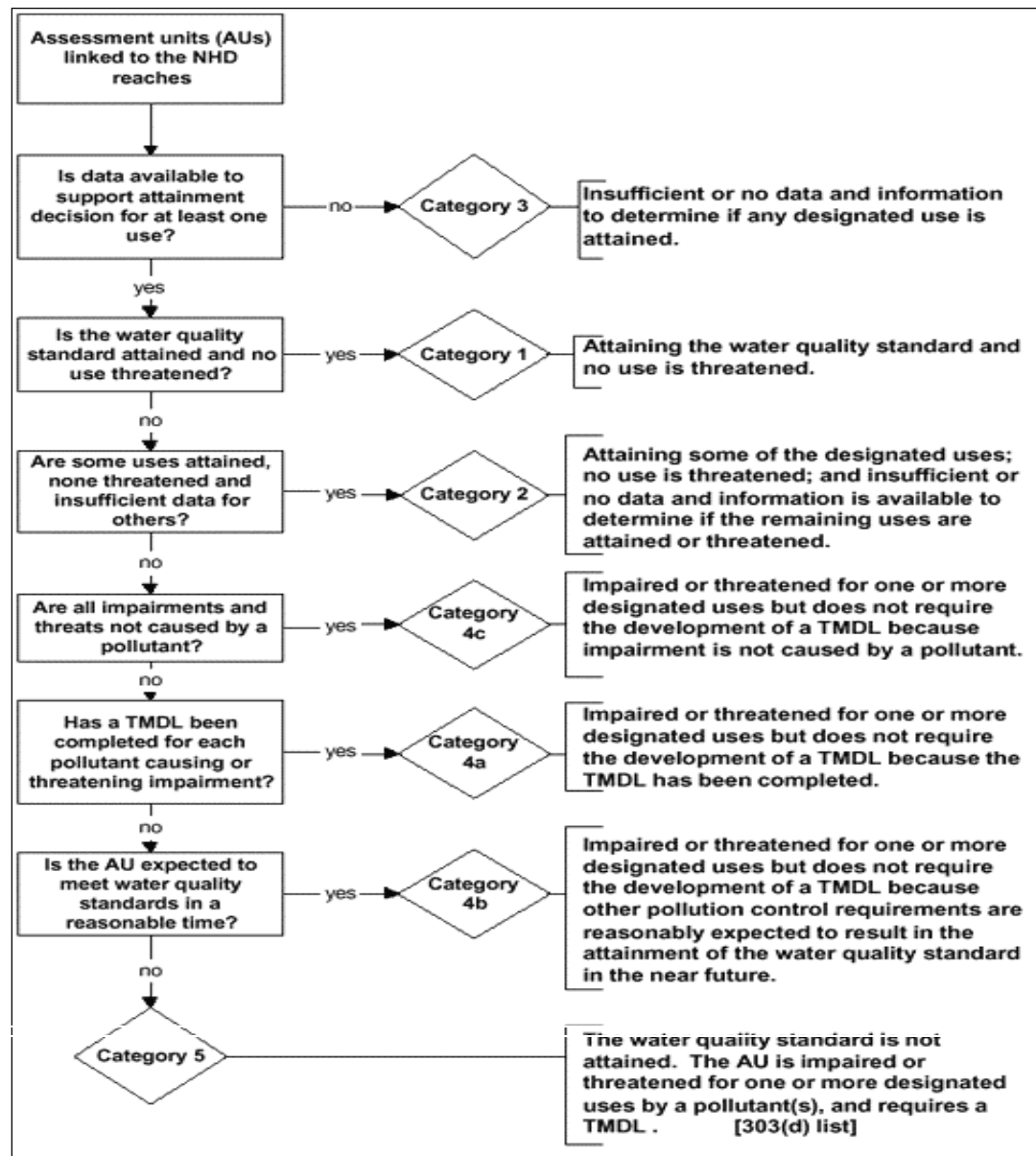
If a state or territory lists the AU in Category 5, but is uncertain that the impairment is caused by a pollutant, EPA recommends that the TMDL schedule include time for additional monitoring to confirm the cause of the impairment. If the additional monitoring determines the cause of the impairment to be a pollutant(s), the state or territory must complete a TMDL(s) for the pollutant(s). If the additional monitoring determines the impairment is not caused by a pollutant, the state or territory should move the AU to Category 4c.

[If a state or territory determines that an AU does not meet a use based on biological information and the cause of the impairment is unknown, the AU may be listed in Category 3. If a state or territory lists the AU in Category 3, EPA strongly recommends that the state or territory schedule additional monitoring to expeditiously determine the cause of the impairment. ] *This paragraph was deleted by Chuck Sutfin per e-mail dated 01/24/02. See USEPA website - <http://www.epa.gov/owow/tmdl/guidance/biochange20302.html>*

Monitoring schedules should be consistent with state and territorial monitoring strategies and annual work plans required for Section 106 grants. Monitoring schedules should identify which AUs in each category will be monitored each year. EPA believes that, in many situations, a rotating basin approach is a preferred approach to water quality monitoring. The use of a rotating basin approach generally increases efficiency and coverage of monitoring activities and follow-up management actions including development of TMDLs, issuance of NPDES permits, and the review of water quality standards. EPA recommends that monitoring schedules be supportive of the rotating basin approach.

A logic diagram summarizing how AUs would be placed in the five sublists described above can be found in Diagram 1 on the next page.

**Diagram 1: Summary of Logic Used to Place Waterbodies into 5 Sublists in the 2002 Integrated Report**



## **Supporting Data and Information**

Appendix A provides a summary of the data EPA requests states and territories submit. Appendix B documents the format and a detailed description of the data elements summarized in Appendix A. These data elements are included in EPA's Assessment Database, a relational database for tracking water quality assessments.

## **Public Participation**

States and territories should provide for public participation in the development of their *Integrated Report* prior to its submission to EPA. EPA believes that public understanding of how standard attainment determinations are made for all AUs is crucial to the success of water quality programs and encourages active stakeholder participation in the assessment and listing process. States and territories should provide EPA with a summary of comments received and the responses made. EPA will consider how the state or territory addressed the comments on the *Integrated Report* when approving or disapproving the 303(d) list of AUs (Category 5).

## **Submission to EPA**

States and territories must submit their *Integrated Report* to EPA by October 1, 2002. Submissions following the existing guidance are also due by October 1, 2002. The *Integrated Report* should include the following components:

1. An assessment and listing methodology;
2. The delineation of AUs based on the National Hydrography Dataset (NHD) as described in Appendix B, and an integrated list of all AUs in the state or territory in the five sublists described in this guidance;
3. Data and information supporting the categorization of each AU in EPA's Assessment Database format (Appendix B);
4. A description of the public participation process, and a summary of the comments received and the responses made to the comments; and
5. An assessment report based on a probability design if a component of the monitoring strategy.

States and territories are encouraged to share interim products (1- 5 above) and drafts of their *Integrated Report* with EPA prior to final submission. *Integrated Reports* may be submitted electronically using the Assessment Database.

## **EPA Action on Section 303(d) Lists**

EPA will review and approve, partially approve/disapprove, or disapprove state or territorial 303(d) lists of impaired and threatened AUs requiring a TMDL (Category 5). EPA's review and approval of the 303(d) list will be based on a determination that the state's or territory's assessment and listing methodology was used to prepare the list, that the assessment and listing methodology is scientifically sound, that it is consistent with the state's or territory's water quality standards, and that the state or territory reasonably

considered all existing and readily available data and information, and listed all waters not attaining water quality standards. Upon completing its review of the 303(d) list, EPA will send a letter to the state or territory notifying it of full approval, partial approval/disapproval, or disapproval. If the list is partially approved/disapproved, or disapproved, EPA will develop a list for the state or territory. EPA will also provide 30 days for public comment on the EPA developed list.

### **Support from EPA Regions and Headquarters**

Questions regarding the interpretation of this guidance should be directed to EPA Regions. Regions may direct questions to Michael Haire at EPA headquarters, 202-260-2734, [haire.michael@epa.gov](mailto:haire.michael@epa.gov).

### **Appendices**

Appendix A: Summary matrix of information required by category to be included in *2002 Integrated Water Quality Monitoring and Assessment Report*.

Appendix B: Data elements for *2002 Integrated Water Quality Monitoring and Assessment Report* and documentation for defining and linking assessment units to the National Hydrography Dataset.

cc: EPA Assistant Administrator for Water  
EPA Regional Water Quality Branch Chiefs and Monitoring Branch Chiefs  
EPA Regional TMDL, Monitoring and 305(b) coordinators  
EPA OW Office Directors  
EPA OW Division Directors  
EPA OGC, Lee Schroer, Jim Curtin, Susmita Dubey  
EPA ORD, Larry Reiter, Gilman Vieth, Mike McDonald, Barbara Brown,  
Lee Mulkey, Tom Barnwell, Molly Whitworth  
USGS, Robert Hirsch, Steve Sorenson, Mike Norris  
USDA, Tom Christiansen  
USFS, Warren Harper

**APPENDIX A. INFORMATION TO BE INCLUDED IN 2002 INTEGRATED WATER QUALITY MONITORING AND ASSESSMENT REPORT**

Data and Information	Sublist						TMDL needed
	Attaining all standards	Attaining some standards	Insufficient or no data and information to determine if any standards are attained	Impaired or threatened for one or more standards but not needing a TMDL			
				TMDL complete 4a	Expected to meet standards 4b	Not impaired by pollutant 4c	
	1	2	3				5
Name of assessment unit (AU)	x	x	x	x	x	x	x
Type of AU	x	x	x	x	x	x	x
Location of AU based on NHD	x	x	x	x	x	x	x
Standards for AU	x	x	x	x	x	x	x
Assessment type	x	x	x	x	x	x	x
Assessment level	x	x	x	x	x	x	x
Assessment date	x	x	x	x	x	x	x
Observed effect	x	x	x	x	x	x	x
Standard(s) attained	x	x	x	x	x	x	x
Standard(s) not attained (impaired)				x	x	x	x
Standard(s) attained but Threatened						x	x
Standard(s) with Insufficient or No information		x	x	x	x	x	x
Non-pollutant cause(s) of impairment				x	x	x	x
Pollutant(s) for which TMDLs are required				x	x		x
Source(s) of pollutants				x	x		x
Lake trophic status	x	x	x	x	x	x	x
TMDL completion schedule							x
Date TMDL approved				x			x
Monitoring date	x	x	x	x	x	x	x

**Appendix B. Data elements for 2002 *Integrated Water Quality Monitoring and Assessment Report* and documentation for defining and linking Assessment Units to the National Hydrography Dataset.**

5.

The Clean Water Act (CWA) requires states and territories to report water quality monitoring and assessment information to satisfy CWA Sections 303(d) and 305(b). EPA recognizes that states and territories use a variety of monitoring designs which allow them to characterize waters of the United States at different scales. This reporting format accommodates jurisdiction-wide or watershed-level assessments based on probability designs and attainment decisions on individual assessment units (AUs). The purpose of this Appendix is to provide a consistent format for reporting in the *Integrated Report*. This appendix is organized as follows:

**A. Reporting Assessment Unit (AU) Results**

- 1) Define the AUs
- 2) Report AUs geographic information based on the National Hydrography Dataset (NHD)
- 3) Report on the trophic status for all lakes
- 4) Report attainment decisions for each of the AU's standard
- 5) Document how and when the attainment decision for an AU-standard combination was determined
- 6) Report any pollutants and non-pollutants causing impairments with their probable sources for all AUs not attaining standards
- 7) Report any observed effects of pollution for each AU-standard combination
- 8) Report on approved TMDLs and provide a schedule for establishing TMDLs
- 9) Documenting the monitoring schedule

**B. Reporting Attainment Decisions based on Probability Designs**

- 1) Identify the waters assessed through a probability design (Target Population)
- 2) Report the geographic locations of the target populations based on NHD
- 3) Report attainment results for standards
- 4) Report the precision and date of the assessment results
- 5) Report any pollutants and non-pollutants causing impairment with their probable sources for all AUs not attaining standards

**C. Data Elements Reported either in EPA's Assessment Database or the relational database**

**D. Minimal Database Design to support Electronic Submission**

## ***A. Reporting AU Results***

The following information should be submitted in order to identify and characterize AUs within the five sublists outlined in the **2002 Integrated Water Quality Monitoring and Assessment Report Guidance** (*Integrated Report*). Jurisdictions should use a relational database to store and maintain their attainment results and, document decisions on standards attainment status, identify any pollutants or other types of pollution and their sources for all AUs not attaining standards, and report the assessment metadata for each attainment decision. All AU information should be provided in a database format, preferably using EPA's Assessment Database (ADB) software. Following is a brief description of the data elements EPA expects to receive in electronic format. The permissible value domains for these data elements should be used and can be downloaded from <http://www.epa.gov/waters/reporting>. This includes a standardized list of pollutants and non-pollutants, sources, assessment type and level codes.

### ***1) Define the AUs***

As described in the *Integrated Report*, all waters referenced within state and territory standards documents should be assessed and reported on. These types of water may include, but are not limited to, lakes, rivers, estuaries, coastal shorelines, wetlands, and oceans. The basic unit for assessing attainment status for 305(b) and 303(d) attainment is the AU.

The following descriptive information should be included for each AU:

- unique AU identifier (primary key)
- AU type (river/stream, lake/reservoir, coastal shoreline, wetland, etc.)
- AU size and units of measurement
- AU name and location based on the NHD
- the standards for the AU

### ***2) Reporting AUs geographic information using NHD***

Section 305(b)(1) of the Clean Water Act directs each state and territory to prepare and submit to the Administrator biennially a report that describes the water quality of all navigable waters in each state and territory. In order to report the status of all of the Nation's waters in an effective and consistent manner, each state and territory must define their AUs. AUs are the basic unit of record for conducting and reporting the results of all water quality assessments. By employing a systematic approach for AU documentation and adopting the principles described in this *Integrated Report*, states and territories will be able to characterize all of their waters by assigning each AU to one of the five sublists.



Currently, state and territory AUs are defined using a wide range of criteria - from individual monitoring stations to Natural Resource Conservation Service watersheds. Sometimes these AUs are tied to a geographic coverage using geographic information systems (GIS) but more often are only described textually. As a consequence, it is extremely difficult to ensure that all waters are being adequately assessed and managed. EPA strongly encourages states and territories to uniformly adopt the National Hydrography Dataset (NHD) reach addressing protocol for assigning AUs for their 2002 assessments. Reach address is the nomenclature used to precisely locate water features such as AUs. NHD reaches are typically defined from confluence to confluence and are the hydrographic equivalent of a street's block number. A reach address is analogous to a street address number. Additional NHD information and data is available from USGS, <http://nhd.usgs.gov>. EPA will provide hands on training to any interested jurisdiction on the protocols developed to link water quality information to NHD.

A major advantage of linking AUs to NHD is the ability to relate the assessment information to other critical water quality data such as the AUs position within the stream networks, flow, and other information linked to the NHD network. States and territories should document the process used for defining the sizes of AUs in their assessment methodologies. The individual size of AUs will vary based upon assessment methodologies. AUs should, however, be larger than a sampling station but small enough to represent "homogenous" standard attainment within individual assessment units. An individual assessment unit may comprise part of a NHD reach, an individual NHD reach, or a collection of NHD reaches and or parts of reaches.

The use of the NHD protocol for AU delineation provides powerful mapping and spatial analysis capabilities for all water quality characterization activities. This delineation approach will help target resources and activities such as scheduling monitoring, issuing permits, and targeting restoration measures. In particular, the application of NHD will provide much more spatial resolution in identifying AUs requiring the establishment of TMDLs. Furthermore, the incorporation of NHD will aid in developing and implementing management actions in individual and/or multiple AUs to attain standards. Jurisdictions should also use the NHD protocols for defining and linking the AUs covered by completed TMDLs or bundles of TMDLs. This TMDL specific geographic information should be submitted to EPA simultaneously with a TMDL's submission.

For each AU in Sublist 5, the use of the NHD convention clearly defines the geographic bounds affected by the TMDL. This will clearly delineate the specific geographic location of the targeted AU, a clear description of the standard, and a more focused representation of the relevant watershed(s) which contribute point and non-point source pollutant loads. For example, in the establishment of a TMDL for a 303(d) listed AU, pollutant reduction efforts in a non-impaired AU may be the most logical and efficient action to the attainment of standards in the impaired AU. NHD will facilitate the identification of how management actions throughout a watershed can work together to achieve the ultimate result of full support of all standards.

EPA recognizes that some states and territories work with higher resolution spatial data, however, to maintain national consistency for accounting purposes, states and territories are requested to transfer their spatial assessment data to the 1:100,000 scale. NHD is currently being developed at higher resolutions and the NHD protocols provide more automated mechanisms to migrate higher resolution data. States and territories interested in higher resolution NHD are encouraged to work with United States Geological Survey (USGS) to develop NHD at resolutions appropriate for states and territory and local level analyses.

The NHD-Reach Indexing Tool, provides ways to develop GIS layers for all AUs and includes techniques to delineate user-defined polygons to address such features as AUs for wetlands,, large estuaries, oceans, or near coastal AUs. All GIS coverages or event tables submitted to EPA should have clearly identified unique AU identifiers that match those in the jurisdiction's assessment database. Table 1 lists the basic requirements for a GIS submission and the appropriate metadata that should be included in an assessment database.

**Table 1. Reporting on AU Geographic Information**

<b>Water Type</b>	<b>GIS Coverage</b>	<b>Database Metadata</b>
Rivers	River AUs should be included as a linear feature in a GIS coverage. NHD format is preferred.	Include standard metadata requirements for NHD event tables. A list of these requirements can be found at: <a href="http://www.epa.gov/waters/georef/nhdrit_datastructure.zip">http://www.epa.gov/waters/georef/nhdrit_datastructure.zip</a> Otherwise provide Federal Geographic Data Committee (FGDC) "light" metadata about the coverage, as well as the location of an AU identifiers in the coverage that can be joined to those in the database. FGDC metadata requirements can be found at: <a href="http://www.fgdc.gov/metadata/contstan.html">http://www.fgdc.gov/metadata/contstan.html</a>
Lakes	Lake AUs can be included as a linear or polygon feature in a GIS coverage. NHD format is preferred.	Include standard metadata requirements for NHD event tables. A list of these requirements can be found at: <a href="http://www.epa.gov/waters/georef/nhdrit_datastructure.zip">http://www.epa.gov/waters/georef/nhdrit_datastructure.zip</a> Otherwise provide Federal Geographic Data Committee (FGDC) "light" metadata about the coverage, as well as the location of a AU identifiers in the coverage that can be joined to those in the database. FGDC metadata requirements can be found at: <a href="http://www.fgdc.gov/metadata/contstan.html">http://www.fgdc.gov/metadata/contstan.html</a>
Estuaries	Estuarine AUs should be included as a polygon feature in a GIS coverage.	Include Federal Geographic Data Committee (FGDC) "light" metadata about the coverage, as well as the location of a AU identifiers in the coverage that can be joined to those in the database. FGDC metadata requirements can be found at: <a href="http://www.fgdc.gov/metadata/contstan.html">http://www.fgdc.gov/metadata/contstan.html</a>

**October 5, 2001 Final Draft**

<b>Water Type</b>	<b>GIS Coverage</b>	<b>Database Metadata</b>
Coastal Waters quality	Coastal shoreline AUs should be included as a linear feature in a GIS coverage. Other near coastal units (e.g., shellfish beds) should be reported as polygons.	Include standard metadata requirements for NHD event tables. A list of these requirements can be found at: <a href="http://www.epa.gov/waters/georef/nhdrit_datastructure.zip">http://www.epa.gov/waters/georef/nhdrit_datastructure.zip</a> . Otherwise provide Include Federal Geographic Data Committee (FGDC) “light” metadata about the coverage, as well as the location of a AU identifiers in the coverage that can be joined to those in the database. FGDC metadata requirements can be found at: <a href="http://www.fgdc.gov/metadata/contstan.html">http://www.fgdc.gov/metadata/contstan.html</a>
Wetlands	Wetlands AUs should be included as a polygon feature in a GIS coverage.	Include Federal Geographic Data Committee (FGDC) “light” metadata about the coverage, as well as the location of a AU identifiers in the coverage that can be joined to those in the database. FGDC metadata requirements can be found at: <a href="http://www.fgdc.gov/metadata/contstan.html">http://www.fgdc.gov/metadata/contstan.html</a>

***3) Report on the trophic status for all lakes***

The trophic condition of all lakes must be reported using values found on <http://www.epa.gov/waters/reporting> .

***4) Report attainment decisions for each of the AU’s Water Quality Standards***

EPA encourages states and territories to provide assessment information for each AU’s standards. Each AU’s standard(s) should be assessed and reported to have one of the following conditions:

- Attaining standard
- Not Attaining standard
- Insufficient or no data and information - AUs with insufficient data and information to support an attainment determination for a standard.

These standard attainment categories vary from those described in the previous EPA 305(b) Guidelines. The old assessment categories should be translated to the new categories as follows:

- Attaining standards (sublist 1 or 2) - Fully Supporting
- Attaining standards (sublist 1 or 2) - Fully Supporting but Threatened
- Not Attaining standards (sublist 4 or 5) - Partially Supporting
- Not Attaining standards (sublist 4 or 5) - Not Supporting

For AUs which are not attaining one or more standards, jurisdictions should determine and report if the water is expected to attain all its standards by the next cycle.

Threatened waters are those AUs where a jurisdiction has determined that sufficient data exists to determine that all standards are being attained, and that non-attainment is predicted by the time the next *Integrated Report* is due to be submitted. These AUs should be included in Sublist 5.

**5) Document how and when the attainment decision for a specific AU-standard combination was determined**

For each assessed standard for each water, EPA requests the following information be included to document the attainment decision:

- Assessment Date (e.g., December 20, 2003) - This date should document when the jurisdiction completed the technical analysis of data and made its decision on the standard attainment status. A common way to store a full Y2K-compliant date is in the character format YYYYMMDD (e.g., 20031220 for December 20, 2003).
- Assessment type - For each assessed standard for a given water, the jurisdiction should list all type of data used in the assessment process (e.g., physical/chemical monitoring, toxicity testing (e.g., bioassays), benthic macro-invertebrate surveys, etc.).
- Assessment level - Assessment levels, which range from 1 (least rigorous) to 4 (most rigorous) should be reported for each assessment type. Jurisdictions should provide definitions of their assessment levels in their assessment methodologies.

**6) Report any pollutants and or non-pollutants causing impairment with their probable sources for all AUs not attaining standards**

Jurisdictions must report all of the pollutants or other types of pollution for every impaired or threatened AU. The list of acceptable pollutants and other types of pollution is available on <http://www.epa.gov/waters/reporting>. The list contains a complete set of chemical characteristics and non-pollutant causes of impairment. Jurisdictions should link the pollutant to the standard or standards that are not being attained. Jurisdictions should also indicate the specific pollutant causing impairment when known.

Jurisdictions must also identify the probable sources contributing to an impairment. The sources should be documented using the list provided on <http://www.epa.gov/waters/reporting>. These sources need to be linked to the appropriate pollutant causing the impairment.

**7) *Report any observed effects of pollution for each AU-standard combination***

Jurisdictions should document and report any observed effects of pollution for each AU-standard combination. Observed effects may include; fish legions, fish kills, stream bottom deposits, low combined biota/habitat bioassessment. Using observed effects to make attainment decisions is dependent upon a jurisdiction's interpretation of their water quality standards and should be documented in their assessment methodology. Documenting observed effects is most important in AU's which are not attaining one or more standards but the pollutant or non-pollutant is unknown.

**8) *Report on approved TMDLs and provide a schedule for establishing TMDLs***

Jurisdictions must submit an estimated schedule for establishing TMDLs for every pollutant on each AU in Sublist 5. This schedule should specify the month/ year for all TMDLs which will be established prior to the next *Integrated Report*, and as a year for all others. In addition jurisdictions should indicate which of the pollutants on impaired AUs have an approved TMDL. Jurisdictions should indicate the date EPA approved these TMDLs and the EPA TMDL identification number. Information on the approval date and EPA TMDL identification number can be found on <http://www.epa.gov/waters/reporting>.

**9) *Documenting the monitoring schedule***

The *Integrated Report* of all AUs should include monitoring schedules (reported as a year) for AUs that will be monitored and assessed prior to the submission of the next *Integrated Report*. The schedules should be consistent with state and territory rotating basin approaches, monitoring strategies and work plans required for Section 106 grants.

**B. *Reporting attainment decisions based on probability designs***

## ***State-wide or Watershed-level Assessments Based on Probability Designs***

The following sections address the data requirements recommended by EPA to report probability-based standards attainment decisions and supporting assessment information. This section of the guidance is EPA's first attempt at defining the data elements and format necessary to document a jurisdiction's attainment decisions based upon probability based monitoring designs. Attainment decisions based on probability designs are intended to cover those areas where the data for the predictions are taken. Over time, EPA will work with the states and territories to clarify and improve the methods to transmit attainment decisions based on probability based designs.

AUs which were part of a probability based sampling design may have data and information which satisfies the jurisdiction's methodology for determining whether standards are attained or maintained. Generally, however, individual AUs that were part of the target population do not have enough data and information needed to make an attainment decision consistent with the jurisdiction's methodology. These AUs should be placed in Sublist 3.

### ***1) Identify the waters assessed through a probability design. (Target Population)***

Study area findings should be associated with the area's standard(s) and should be clearly documented along with the "Target Population" that was monitored to develop the indicator. For instance, wadeable perennial streams throughout a state and territory may be the target population for an indicator of biological integrity related to aquatic life support. Each probability survey project should be assigned an ID (a Probability Survey Project ID). Table 2 shows how this basic information on state probability survey projects should be organized.

### ***2) Report the geographic locations of the target populations.***

Where the target population is not the same as an entire state, maps should be provided that use polygons to highlight a project's geographic area such as watershed units, eco-regions, or other geographic regions. States and territories are expected to have GIS polygon coverages related to each probability survey project. GIS coverages should conform to Federal Geographic Data Committee (FGDC) Geospatial Data Metadata Standards. State in-house probability survey project polygons should be available with basic FGDC-compliant metadata in either a shape file format or in a standard ESRI export file format (\*.e00). More information on the Content Standards for Digital Geospatial Metadata (CSDGM) can be found at the following url: <http://www.fgdc.gov/metadata/constan.html>.

Additional information to define the geographic frame (sample frame or “population”) for a probability survey project should include such items as: the water type relevant to the project (e.g., rivers); or other “stratification” features (e.g., only for small wadeable streams identified as Horton-Sprawler Order 1-4).

States and territories are also expected to develop size estimates for the entire target population. States and territories should be able to document the GIS Hydrography coverage or other data layer used to develop their target population sizes.

### ***3) Report attainment results for water quality standards***

For each probability survey project, standard attainment results should be summarized using the format illustrated in Table 2. The table can be accompanied with graphics using pie charts or other business charting layouts. The presentation of the study’s findings should apply a breakpoint that clearly defines the estimated percentage of the total target population meeting standards and the percentage not meeting standards. For each probability survey project, a description of the project methodology should be provided. Where there are a small number of standard project designs, a state can make reference to pertinent sections from its general monitoring design and assessment methodology materials. The estimated percentage of the target population meeting standards should also be accompanied by the precision of the estimate, in the form of 90 or 95% confidence intervals.

### ***(4) Reporting the precision and date of the assessment results.***

A major attraction of probability designs is that statistics can be developed that show the confidence levels associated with attainment results. States and territories should provide a discussion of the statistical tests they apply to produce the precision value information illustrated in Table 2. As with reporting for AU results, the assessment data should be included for each probability survey project indicating when the state and territory finished the technical analysis of data and made its decision on the standards attainment status. Table 2 illustrates how to display the assessment date in a Y2K-compliant format (YYMMDD).

### ***5) Report any pollutants and non-pollutants with their probable sources.***

Where possible, EPA requests that states and territories develop pollutant and source summary information for each of their probability survey projects using the format illustrated in Table 3. The maximum impact percentage in these tables should not exceed the percent for the use non-attainment results reported in Table 2 (a value of 25% for this hypothetical case).

**Table 2. Reporting format for the attainment results calculated using a probabilistic monitoring design.**

<i>Project Name</i>	<i>Target Population</i>	<i>Project_ID</i>				<i>Designated Use</i>	<i>Attaining</i>	<i>Not Attaining</i>				<i>Attainment Date</i>	<i>Confidence</i>
Downstate Sample Survey	All streams ordered 4 or greater in basin C			100		Life	75%	25%	al			4/5/26/2000	90%

**Table 3. Reporting impairments and potential sources of impairment identified using a probabilistic monitoring design.**

<i>Project_ID</i>	<i>Designated Use</i>	<i>Impairment_ID</i>	<i>Impairment_Percent</i>	<i>Source_ID</i>	<i>Source_Percent</i>
	Life	15	5%	2	70%
	Life	166	10%	3	20%
	Life	166	10%	3	10%



**C. Data Elements Reported either in EPA’s Assessment Database or the relational database**

Data elements to be reported using either EPA’s Assessment Database or the relational database structure outlined in Section D, Minimal Database Elements to Support Electronic Submission are described in Table 4 below.

#### **D. Minimal Database Design to support electronic submission of the Integrated Report**

The data elements and business processes outlined in the previous three sections must be assembled into a relational database design. EPA's Assessment Database is one data base design capable of storing and reporting the attainment status of a jurisdiction's waters. States and territories should use EPA's Assessment Database to track the attainment status of their AUs and to submit the supporting information behind their *Integrated Report*. If a state or territory or authorized Tribe chooses not to use the Assessment Database, then at a minimum they should use the database design outlined in Diagram A with the data elements described in Table 4 to transmit their *Integrated Report* to EPA. EPA will provide any interested state or territory training and support using the Assessment Database.

## Appendix II

### Data Sources for the 2002 New Jersey Integrated Report

The 2001 Guidance Document (USEPA 2001) recommends several sources of information be considered as a basis for identifying impaired waters. Data and information useful for assessing water quality was available from many of these sources as well as additional sources identified by the Department. These data sources are discussed below. If data from a particular source was not included in the 2002 Assessment, the reason for not using it is stated. Monitoring data sources are summarized on Table XX: Summary of State Monitoring Data used for the 2002 New Jersey Integrated Report.

**NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN):** The New Jersey Department of Environmental Protection (NJDEP) and the United States Geological Survey (USGS) have cooperatively operated the Ambient Stream Monitoring Network since the 1970's. The data from this network have been used to identify status and trends for conventional water quality parameters, metals and recreational designated uses (fecal coliform) in freshwater, non-tidal streams as well as sediment quality.

A Quality Assurance Project Plan was developed and approved each year for the NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN).

In 1996 and 1997, the ASMN included 81 stations located outside of regulatory mixing zone in well mixed, non-tidal areas. Sites were located using GPS. Conventional water quality samples were collected 5 times per year; metals were collected 2 times per year at about 2/3 of the stations on a rotating basis. Samples were collected using cross-sectional, depth-integrated sample collection techniques. Beginning in 1995, modified Clean Methods sampling techniques were implemented to improve metals data quality. Concurrent measurement of stream discharge was also collected. USGS report on water quality trends was used to assess threats to water quality (USGS, 1999).

**Redesigned Ambient Stream Monitoring Network:** Although the previous network was sufficient to assess general status and trends, changes were needed to provide data for water quality indicators and watershed management. The new network, which was designed by a NJDEP and USGS interagency committee, has been operating since October 1997. By using several different types of monitoring stations, the Redesigned Ambient Stream Monitoring Network is designed to answer several important questions about surface water quality.

**Reference Stations:** To characterize water quality in undeveloped areas, 6 reference stations have been established in the 4 physiographic regions of the state. Data from these stations will be used to evaluate degradation in developed areas and to provide additional data to support surface water quality standards.

***Land Use Indicator Stations:*** To characterize the effects of the 2 dominant land uses in each of 20 watershed management areas (WMA), 40 land use indicator stations were selected. Drainage area, and percent of urban, agricultural, and forest from the most recent Land Use/ Land Cover data were used to select these stations. Many Land Use Indicator stations are also monitored in the Benthic Macroinvertebrate (AMNET) Monitoring Network. These data will provide insight into the biological effects of chemical pollutants, and the effects of nonpoint sources from dominant land uses on chemical and biological water quality.

***Statewide Status Stations:*** To provide a strong statistical basis for estimating statewide water quality indicators, 40 status stations are selected. Two statewide status stations per WMA were randomly selected from the set of ~800 Benthic Macroinvertebrate Network stations to provide a probabilistic monitoring component. These status stations are monitored for 2 years after which 40 new stations are randomly selected to increase spatial coverage. These stations provide site-specific data at an increasing number of locations and can identify emerging issues.

***Watershed Integrator Stations:*** Watershed integrator stations were located at the outlet of each WMA and at the outlets of larger watersheds within WMAs. The 23 watershed integrator stations will be used to characterize downstream water quality and will be assessed together with data from Coastal and Estuarine Water Quality Monitoring Network to evaluate pollutant transport to back bays.

***Watershed Reconnaissance:*** Resources to conduct watershed reconnaissance sampling are available each year to address data needs. Watershed reconnaissance sampling has recently been used to monitor diurnal DO at a subset of ASMN stations.

***Parameters:*** Bacteria were monitored 5 times within 30-days as recommended in the NJSWQS. Conventional water quality parameters (i.e., dissolved oxygen, nutrients, solids, and pH) were monitored at all stations seasonally, 4 times per year. Diurnal DO data were collected at a subset of ASMN stations. Flow is continuously monitored or instantaneous discharge measurements were collected during seasonal monitoring at all stations except Statewide Status stations. Monitoring at the 6 reference stations and 40 statewide status stations included one sample event per year for total recoverable metals, pesticides and volatile organic chemicals.

For both the ASMN and Redesigned ASMN, conventional water quality samples were sent to the New Jersey Department of Health and Senior Services (NJDHSS) NJ state certified laboratory; metals samples were analyzed for total recoverable (TR) metals at the USGS National Laboratory in Denver. Samples were analyzed using USEPA approved methods or equivalent USGS methods.

Data were managed in USGS's National Water Information System (NWIS) and USEPA's Storage and Retrieval (STORET) database. Raw data collected between 1/96 and 12/2000 were reported by USGS in Water Year Reports. (USGS, 1997, 1998, 1999,

2000, 2001). Electronic data are available to be downloaded from NWIS at [www.usgs.gov/nwis](http://www.usgs.gov/nwis) or USEPA's STORET database at [www.epa.gov/owow/STORET](http://www.epa.gov/owow/STORET).

**303d Evaluation Monitoring:** The 303d Evaluation Monitoring, also called 303d Reconnaissance Monitoring was initiated in 1998 to provide high quality, current data regarding concentrations of total recoverable and dissolved metals in waterbodies included on the 1998 303d List for metals.

A Quality Assurance Project Plan was developed and approved. Locational data were obtained using Global Positioning System (GPS). Sites were sampled three times during stable baseflow, often for 3 consecutive days; all sites in a WMA were sampled on the same day. Total recoverable (TR) and dissolved fraction (DF) metals samples were collected using modified Clean Methods techniques. Bottom sediment samples were also collected. USGS determined when stable baseflow conditions existed and collected flow measurements on day 2 of sampling. Samples were analyzed at the New Jersey Department of Health and Senior Services (NJDHSS) NJ State certified laboratory using EPA approved methods.

Data were reviewed by NJDEP and are being entered into USEPA's Storage and Retrieval System (STORET) available at [www.epa.gov/owow/STORET](http://www.epa.gov/owow/STORET) and are published in Preliminary Data Reports on 303d Reconnaissance Monitoring for each Watershed Management Area.

**USGS National Ambient Water Quality Assessment:** The final report from the Long Island New Jersey National Ambient Water Quality Assessment (NAWQA) program was used to evaluate conventionals in freshwater non-tidal streams (USGS, 2000).

**Marine and Estuarine Monitoring Program:** NJDEP's Marine and Estuarine Monitoring Program was used to assess SWQS attainment, aquatic life and recreational designated uses. This monitoring network included 200 stations in tidal rivers, back bays, estuaries and inlets that were monitored quarterly for dissolved oxygen, ammonia-nitrogen, nitrate-nitrite, organic nitrogen, ortho-phosphate, chlorophyll a, Secchi depth, salinity, temperature, pH, suspended solids, fecal and enterococcus bacteria. The stations were a subset of the National Shellfish Sanitation Program stations. Data is available from the Marine Monitoring Program. Their website is <http://www.state.nj.us/dep/watershedmgt/bmw/reports.htm>

**Ambient Biological Monitoring Network (AMNET):** Aquatic life designated uses in rivers were assessed using NJDEP's Ambient Biological Monitoring Network (AMNET). This network monitored benthic macroinvertebrate organisms, including crustacean, larval insects, snails and worms, which are ubiquitous throughout the state's streams and an important component of the aquatic food web. Over 800 AMNET stations located in freshwater, non-tidal streams were sampled on a 5-year rotating schedule. Round 1 sampling was completed in the mid-1990s. Round 2 sampling conducted between 1997 and 2001 was used for this 2002 New Jersey Integrated Report.

Benthic macroinvertebrate communities were examined using USEPA's Rapid Bioassessment Protocols - Level II (see Plafkin, et. al, 1989; NJDEP, 1992). Communities were examined for pollution tolerant and intolerant forms and the results were used to compute the New Jersey Impairment Score (NJIS). NJIS scores were used to assess aquatic life designated uses as follows: **full attainment** (non-impaired; NJIS: 24-30), **non-attainment** (moderately impaired; NJIS: 9-21 and severely impaired; NJIS: 0-6). Round 2 sampling included a qualitative assessment of stream habitat quality, which was used to compute a Habitat Assessment Score. The habitat condition can provide insight into factors that contribute to biological impairment.

AMNET monitoring results are being entered into USEPA's Storage and Retrieval System (STORET) available at [www.epa.gov/owow/STORET](http://www.epa.gov/owow/STORET); reports are published by NJDEP's Water Monitoring Management Program ([www.state.nj.us/dep/watershedmgt/bfbm](http://www.state.nj.us/dep/watershedmgt/bfbm))

**Warmwater Fisheries Populations:** Aquatic life designated use assessment in lakes was based on assessments of lake fisheries performed by the Division of Fish and Wildlife. Lakes were selected for assessment based on the Warmwater Fisheries Management Plan, which provides primary guidance for Warmwater fisheries management in New Jersey (NJDEP, 1998b).

Fish populations were sampled using electrofishing (spring or fall), shoreline seining (summer to assess fish reproduction), and/or gillnetting (fall). Conventional water quality parameters such as dissolved oxygen; pH and nutrients are recorded during the summer months when the water columns are most stratified. Fish population data were assessed by experienced fishery biologists to determine the actual or potential recreational value as a fishery and used to recommend strategies to maintain or enhance the resource.

Although the Bureau of Freshwater Fisheries is principally concerned with the recreational value of the fisheries, the assessments were based on the diversity of fish species, not only species of recreational value. Many sport fish are carnivores that depend upon an abundant and diverse forage base to support their populations. Hence, although many of these lakes are stocked, assessment results are not affected by the stocking.

Individual lake assessment reports are available from the Bureau of Freshwater Fisheries by calling (908) 236-2118.

**Clean Lakes Program:** The Clean Lakes Program was used to assess aesthetic quality of public lakes. This program was designed by USEPA to facilitate identification and remediation of eutrophic public lakes. Between 1977 and 1992, public lakes with recreational use impairments were identified by lake associations, municipalities or other entities; studies were conducted to characterize water quality and as funding was available, remediation projects were conducted. Also during the 1980's and early 1990's, NJDEP collected water quality data on a number of public lakes. The trophic status of lakes was assessed using USEPA Clean Lakes Program Guidance Manual based on total

phosphorus, Secchi disk transparency and chlorophyll *a* levels (USEPA 1980). Individual Clean Lake Reports are available by calling (609) 292-0427.

**USEPA Helicopter Monitoring Program:** The USEPA Helicopter Monitoring Program was used to assess aquatic life and recreational designated use attainment in ocean waters. USEPA- Region 2 monitors water quality in the ocean at a series of 10 transects that extend eastward from Sandy Hook to Cape May with samples taken at 1, 3, 5, 7, and 9 mile points along each transect. This assessment was based on data collected at the 1 and 3 mile stations, which were located within New Jersey's 3-mile jurisdiction. Samples collected eight to ten times during the summer between 1996 and 2001 were used for this Integrated Report. Parameters included dissolved oxygen and fecal coliform.

The aquatic life assessment for ocean waters was based on dissolved oxygen (DO) data collected in the USEPA Helicopter Monitoring Program. USEPA-Region 2 has found over many years of monitoring that surface DO levels are consistently acceptable (DO is at or above 5mg/l). Therefore, DO monitoring at the surface was discontinued and NJDEP assumed that surface DO is at or above 5mg/l. The DO assessment was based on DO recorded one meter above the ocean bottom.

**Fish Consumption Advisories:** The presence of fish consumption advisories and bans was used to evaluate fish consumption designated use. In 1976, monitoring of fish and shellfish tissue for contaminants of concern to human health was initiated. Sampling locations were chosen to include areas where known or suspected sources of persistent bioaccumulative toxics (PBTs) might be found (e.g., PCBs, dioxin, pesticides, and mercury). These included freshwater, estuarine and marine areas important to both recreational and commercial fisheries. Data were collected primarily through research projects targeted at species and drainages where contamination was found. The Interagency Toxics in Biota Committee, with representatives from NJDEP and NJDHSS, oversees the issuance of fish consumption advisories and bans as needed to protect human health. Sampling locations and advisories are routinely listed at the NJDEP Website (i.e., [www.state.nj.us/dep/fgw](http://www.state.nj.us/dep/fgw)) and in the New Jersey Fish and Wildlife Digests (NJDEP 2000a and NJDEP 2000b).

**National Shellfish Sanitation Program:** National Shellfish Sanitation Program was used to assess shellfish consumption designated use. Shellfish harvesting areas are classified in accordance with the National Shellfish Sanitation Program (NSSP) through monitoring total and fecal coliform bacteria in water and shellfish at over 2,500 sites between 5 and 12 times per year and conducting sanitary surveys to identify potential pollution sources. [www.state.nj.us/dep/watershedmgt/bmw/reports.htm](http://www.state.nj.us/dep/watershedmgt/bmw/reports.htm)

**Cooperative Coastal Monitoring Program:** The Cooperative Coastal Monitoring Program (CCMP) was used to assess recreational designated use attainment at ocean and bay bathing beaches. A Quality Assurance Project Plan is developed and approved each year prior to the start of sampling. This monitoring program is cooperatively operated by NJDEP, the New Jersey Department of Health and Senior Services (NJDHSS) and local health agencies. Ocean and bay bathing beaches are monitored weekly, with over 6000

samples collected each summer between Memorial Day and Labor Day at 179 ocean beaches and 139 bay beaches. Results are used to open and close bathing beaches to protect public health.

**Lake Bathing Beach Data:** The Lake Bathing Beach monitoring program was used to assess recreational designated use attainment at lake bathing beaches. The NJDHSS oversees monitoring by local health agencies at about 360 lake beaches in New Jersey. Fecal coliform data (not closure records) were provided to NJDEP for use in Lake Beach assessments. Approximately 180 of 360 beaches have been located on GIS. Lack of GIS locations precluded assessments of the remaining lakes; efforts are underway to locate these lake beaches.

**1998 Impaired Waterbodies List (303d):** Data sources for the 1998 Impaired Waterbodies List included: Ambient Stream Monitoring Network, Ambient Biological Monitoring Network, Clean Lakes Program, National Shellfish Sanitation Program, Fish Consumption Advisories, National Estuary Programs, previous Impaired Waterbodies Lists, Waterbodies Impaired by Toxics (304(l)) Lists. Waterbodies on the 1998 Impaired Waterbodies List were placed on one of 5 sublists based on new data and assessments; or were retained on Sublist 5 in the 2002 Integrated Report if no new data were available to update the previous assessments.

**Nonpoint Source Assessment (319):** The most recent Nonpoint Source Assessment was incorporated into the 2000 New Jersey Water Quality Inventory Report.

**Predictive Models.** NJDEP has listed waters as impaired due predictive modeling (e.g., Delaware River VOCs) and will continue to do so (e.g., Whippany River TMDL results). EPA used predictive models and data to delist metals for New Jersey in the NYNJ harbor.

**Local water quality data and information:** NJDEP solicited local water quality data and information through a notice published in the New Jersey Register on May 21, 2001, NJDEP Bulletin and NJDEP Website. In addition, letters were mailed to local entities requesting data for the 2002 Integrated Report. Data were accepted by NJDEP for a period of 6 months and were required to be accompanied by an approved or “approvable” Quality Assurance Project Plan, accurate monitoring sites locations, electronic data format, citeable report and contact information. Data that met these conditions were received from the following entities:

**Monmouth County Health Department** Benthic Macroinvertebrate data and ambient chemical data was collected to: support watershed initiatives; track water quality trends; obtain water quality and habitat data which could be correlated with erodible soils and land uses; and, coordinate the collection of biological data with ambient stream chemical and bacteriological monitoring. Macroinvertebrate samples were collected from Fall of 1999 through Fall of 2000. Ambient water chemistry was collected four times a year, during the months of March, June, October, and December from 1996 through 2000. Parameters included: pH, fecal coliform, TSS, phosphorus, and ammonia. Macroinvertebrate and water chemistry data are available from the Monmouth County



Health Department's website at  
<http://www.visitmonmouth.com/health/environmental/water/water.htm>.

**Pequannock River Coalition** Diurnal temperature data were collected at 12 stations in the Pequannock River watershed during the summers of 2000 and 2001. Data is available from the Coalition at P.O. Box 392, Newfoundland, New Jersey 07435. (973-492-3212)

**Hudson Regional Health Commission:** The purpose of this data collection was to obtain baseline data for fecal coliform and to identify conditions which might influence concentrations such as tides, rainfall or temperature. The sampling sites were selected to represent sites publicly accessible with some recreational usage (kayaking, jet skis) Water samples were collected weekly from June 20, 2001 till October 30<sup>th</sup> for a total of 18 samples per site. One of the four sites had to be relocated after the 9/11 incident. Data are available from the Commission at 595 County Avenue, Secaucus, NJ 07094

**Interstate Environmental Commission** – The Commission provided fecal coliform and dissolved oxygen data for the shared waters of the NY-NJ Harbor complex. Fecal Coliform data were collected twice a week for 5 weeks (1997-2001). Information on these data can be obtained from the Commission at 311 West 43<sup>rd</sup> Street, Suite 201, New York, NY 1036. <http://www.iec-nynjct.org/reports.htm>

**Delaware River Basin Commission** has the 305(b) Report responsibility for the Delaware River mainstem and estuary. The Department incorporated the Commission's Assessments into the Integrated Report. DRBC's 305 (b) Report can be found on their web page at <http://www.state.nj.us/drbc>

**Water quality management plans** Water *Quality Management Plans* were used to identify waters where TMDLs have been completed.

**Superfund and RCRA** – The Department considered data from contaminated sites in several specific instances. Five (5) waterbodies were added to the 1998 Impaired Waterbodies List as remanded by USEPA due to pollutants from contaminated sites (Federal Register Vol. 66, Number 195, Tuesday October 9, 2001). The 303d Evaluation Monitoring identified lead contamination in the Rancocas River due to activities at Fort Dix; remediation is underway. Superfund and RCRA data are not computerized and thus are generally not readily available. However, the Department is developing EQUIS database for chemical contaminants at over 8000 contaminated sites in New Jersey. Contaminated sites will be considered in more detail as the EQUIS database is populated.

**Table A1: Summary of Monitoring Data used for the 2002 New Jersey Integrated Report**

<b>Waterbody Type</b>	<b>Data Source for Assessment</b>	<b>Time Period</b>	<b># of Stations</b>	<b>Parameters (1)</b>	<b>Notes</b>
<b>Data Sources for Conventional Water Quality Parameters Assessments</b>					
Rivers- freshwater, non-tidal	NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN)	10/95-9/97	76	Conventionals	Trends assessment available (1986-95)
Rivers- freshwater, non-tidal	NJDEP-USGS Redesignated ASMN	10/97-9/00	179	Conventionals	Diurnal DO at subset of stations
Rivers- freshwater, non-tidal	USGS/Pinelands Commission	10/96-9/98	15	Conventionals	
Rivers- freshwater, non-tidal	Monmouth County Health Department	01/96-12/00	39	Conventionals	
Rivers- freshwater, non-tidal	Pequannock River Coalition	05/00-09/01	12	Conventionals	
Rivers- freshwater, non-tidal	USGS National Ambient Water Quality Assessment	04/96-09/98	6	Conventionals	
Rivers-tidal, estuary	Interstate Environmental Commission	1997-2001	15	Conventionals	
Rivers-tidal, estuary	Hudson Regional Health Commission:	2000	4	Conventionals	
Rivers – tidal, Estuaries & Inlets	NJDEP Marine and Estuarine Water Quality	1996-01	200	Conventionals	
<b>Data Sources for Toxics Water Quality Assessments</b>					
Rivers- freshwater, non-tidal	NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN)	10/95-9/97	76	Unionized Ammonia, Metals	Ammonia -Trends assessment available (1986-95)
Rivers- freshwater, non-tidal	NJDEP-USGS Redesignated ASMN	10/97-9/00	179	Unionized Ammonia, Metals	
Rivers- freshwater, non-tidal	NJDEP 303d Evaluation (Reconnaissance) Monitoring	1998-01	107	Metals	

Waterbody Type	Data Source for Assessment	Time Period	# of Stations	Parameters (1)	Notes
<b>Data Sources for Aquatic Life Designated Use Assessments</b>					
Rivers- freshwater, non-tidal	NJDEP Ambient Biological Monitoring Network (AMNET)	1997-01	~800	Benthic macro-invertebrates	
Lakes	NJDEP Warmwater Fisheries Monitoring	1990-00		Fish Populations	
Rivers – tidal Estuaries & Inlets	NJDEP Marine and Estuarine Water Quality	1997-01	200	Dissolved Oxygen	Mid-water column samples
Rivers- freshwater, non-tidal	Monmouth County Health Department	1999-2000	34	Benthic macro-invertebrates	
Ocean	USEPA Helicopter Monitoring			Dissolved Oxygen	Bottom samples
<b>Data Sources for Recreational Designated Use Assessments</b>					
Rivers- freshwater, non-tidal	NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN)	10/95-9/97	76	Fecal Coliform	Trends assessment available (1986-95)
Rivers- freshwater, non-tidal	NJDEP-USGS Redesignated ASMN	10/97-9/00	179	Fecal Coliform	
Lakes	NJDHSS & Local Health Dept lake bathing beach monitoring	1996-00	~360	Fecal Coliform	
Rivers – tidal Estuaries & Inlets	NJDEP Marine and Estuarine Water Quality	1996-01	200	Fecal Coliform	Open water monitoring
Ocean	USEPA Helicopter Monitoring	1997-01	~44	Fecal Coliform	Open water monitoring
Coastal Beaches	NJDEP, NJDHSS and Local Health Dept Cooperative Coastal Monitoring	2001	179 ocean 138 Bay	Fecal Coliform	~6000 samples each summer; Trends assessment available (1990-01)
<b>Data Sources for Lake Aesthetics Designated Use Assessment</b>					
Lake Aesthetics	NJDEP Clean Lakes Program, Lake Water Quality Assessments, Lakes Bond Act Studies	1977-94	~116	Total Phosphorus, Secchi Depth, Chlorophyll a	1 or more stations in each of 116 public lakes

Waterbody Type	Data Source for Assessment	Time Period	# of Stations	Parameters (1)	Notes
<b><i>Data Sources for Fish Consumption Designated Use Assessment</i></b>					
All waterbodies	Interagency Toxics in Biota Committee published fish consumption advisories	1982-00	NA	Mercury, PCBs, chlordane, DDTs, Dioxin in fish	Based on results of research studies
<b><i>Data Sources for Shellfish Consumption Designated Use Assessment</i></b>					
All SC waters	NJDEP National Shellfish Sanitation Program	1996-01	2,500	Total Coliform, sanitary surveys	Trends assessment available (1976-01)
<b><i>Data Sources for Drinking Water, Industrial and Agricultural Water Supply Designated Use Assessment</i></b>					
Rivers- freshwater, non-tidal	NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN), Redesigned ASMN	10/95-9/00	81 115	DW- Nitrate Ind-pH, TSS Ag-TDS, salinity	Trends assessment available (1986-95)
<b>Notes:</b> Conventional: dissolved oxygen, pH, total phosphorus, total suspended solids, total dissolved solids, sulfate, temperature, nitrate Metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc; beryllium in Delaware River only Organics: placeholder: crosswalk being developed to determine which monitored organics have SWQS criteria					

**Appendix III.**

**NUTRIENT CRITERIA PLAN (PLACEHOLDER)**

## Appendix IV.

### USEPA – USGS – NJDEP Interagency Workgroup Assessment and Listing Methodology for Aquatic Life in Freshwater Streams

#### **Background:**

New Jersey's current Rapid Bioassessment Protocol (RBP) for freshwater streams (NJIS scoring system) was calibrated by EPA Region 2. In doing so, EPA sampled between June and September, at sites having drainage areas greater than approximately 5 square miles. In selecting locations, EPA avoided locations under the direct influence of lakes and impoundments and also avoided sites located within the "core" Pinelands region of New Jersey.

NJDEP current 800 site AMNET monitoring program (based on EPA's calibration) operates by sampling sites once every 5 years; typically 2 sample events per station are now available. Results are used for NJDEP's 305b Aquatic Life assessments and moderately and severely impaired sites were included on 1994, 1996 and 1998 303d Lists.

Some of the 800 sites in the AMNET program are not consistent with the calibration done by EPA Region 2. The Workgroup concluded that there is a lower degree of confidence in aquatic life assessment results from sites that are different from the EPA calibration.

**Goal of Workgroup:** to apply the NJIS scoring to locations where it is best suited and to develop either refinements in the NJIS or alternative assessment methods for those sites for which the current scoring is not best suited.

#### **Workgroup Guidelines:**

- Ensure that sites on Sublist 5 on the Integrated List have the greatest likelihood of needing a TMDL.
- Ensure that sites having a high probability of not needing a TMDL are not inappropriately listed on Sublist 5, but can be moved to 5 if and when it is decided that a TMDL is appropriate.
- Ensure that unique sites are assessed using appropriate methods, thereby ensuring accurate biological assessments regardless of stream type or location.

#### **Aquatic Life Assessment and Listing Method:**

For this protocol, the most recent AMNET assessments are divided into two categories;

- higher level of confidence: conclude that either use is supported or use is not supported (Sublists 1, 2, 4, or 5 as appropriate)
- lower level of confidence: insufficient information to determine use support status (Sublist 3).

1. **Place Pinelands assessments on Sublist 3.** The low pH waters of the NJ Pinelands favor unique biological communities. The "core" Pinelands was not included in the EPA calibration. Therefore, there is a lower degree of confidence in AMNET assessments for Pinelands sites. Pinelands sites, regardless of assessment results, would be regarded as representing insufficient information (Sublist 3).

**2. Sites outside the Pinelands that are non-impaired are assessed as representing full support in the Integrated List (Sublists 1 or 2).** There is a higher level of confidence that non-impaired AMNET sites reflect attainment of aquatic life designated uses.

**3. Sites outside the Pinelands that are severely impaired are assessed as representing no support status (Sublist 5).** There is a higher level of confidence that severely impaired AMNET sites reflect non-attainment of aquatic life designated uses.

**4. Moderately impaired sites that are outside the Pinelands and are not unique sites are assessed as representing no support (Sublist 5).** There is a higher level of confidence that moderately impaired AMNET assessments reflect non-attainment of aquatic life designated uses for sites outside the Pinelands that are not unique sites.

**5. Moderately impaired sites that are outside the Pinelands that are unique sites represent locations where there is currently insufficient data to make an informed assessment of use support (Sublist 3).** Unique sites include headwaters, sites under the influence of lake outlets and sites sampled outside the season used by EPA to calibrate the RBP II protocol for NJ. There is a lower level of confidence that these sites reflect non-attainment of aquatic life designated uses. Additional analyses are needed to ensure that these sites are accurately assessed. If a site is considered unique for any reason it will be placed on Sublist 3.

#### **Unique sites:**

**Small Stream Size:** AMNET assessments derived from sites located on small headwater streams are likely to be affected by the naturally lower community diversity that can occur at these locations. The EPA calibration used drainage areas of approximately 5 square miles or greater and the Interagency 303d Technical Committee evaluation indicated changes in community structure in sites with drainage areas less than 6 square miles.

**Downstream of Impoundment:** AMNET sites immediately downstream of impoundments are likely to be affected by natural nutrient and temperature changes that occur below the impoundment. The EPA calibration avoided sites immediately downstream of impoundments. Currently sites within a 450 foot buffer below impoundments are categorized in this group for our purposes here; however, lake effects may occur farther downstream as a function of lake size, stream hydrology and impoundment type, but a conservative approach was taken for this assessment.

**Seasonality:** AMNET sites sampled between December and March may have artificially lower scores because the invertebrates are smaller and harder to sample in the winter. The EPA calibration was based on data collected between June and September. USGS has evaluated seasonality effects for the workgroup and as a result the workgroup has established the sampling season to be April through November (inclusive). Sites sampled between December and March will be regarded as unique.

## Appendix V.

### Integrated Water Quality Monitoring and Assessment Method for Metals (2002)

#### 1. Workgroup Membership

The workgroup members developed the approach for de-listing metals in the Whippany River.

Dore LaPosta, Chief, Monitoring and Assessment Branch, USEPA Region 2, Co-chair

Karen Schaffer, Team Lead, Water Assessment Team, DSRT, NJDEP, Co-chair

William Bauersfeld, Chief, Data Unit, US Geological Survey - West Trenton

Kevin Berry, Water Assessment Team, DSRT, NJDEP

Randy Braun, Monitoring and Assessment Branch, USEPA Region 2

Richard Coleates, Monitoring and Assessment Branch, USEPA Region 2

Jacob Gibbs, Water Quality Specialist, US Geological Survey - West Trenton

Nancy Immesberger, Water Assessment Team, DSRT, NJDEP

Helen Rancan, Team Lead, Watershed Modeling Team, DWM, NJDEP

Susan Schulz, Fate and Effects Team, USEPA, Region 2

Joel Simpkins, Division of Water Quality, NJDEP

David Stedfast, Assistant District Chief, US Geological Survey - West Trenton

Thomas Vernam, Water Monitoring Management, DWM, NJDEP

#### 2. 1998 Whippany River Metals Listings

The entire Whippany River mainstem was included on the 1996 Impaired Waterbodies List (NJDEP, 1997) based on information contained in Waters Impaired By Toxic Pollutants from Point Sources (NJDEP, 1990) for the following metals: Arsenic (As); Beryllium (Be); Cadmium (Cd); Chromium (Cr); Lead (Pb); Mercury (Hg); Zinc (Zn).

Status with respect to Surface Water Quality Standards was assessed for the 1998 Impaired Waterbodies List using total recoverable data collected in the Ambient Stream Monitoring Network between 1990 and 1997. (NJDEP, 1998) As discussed on pages 14 and A58, results were used to amend the listings for the Whippany River as follows:

**Arsenic** - retained at Morristown and Pine Brook due to minimum detection limit (MDL) issues for the Human Health (HH) criterion

**Beryllium** - delisted at Morristown and Pine Brook due to compliance with proposed SWQS criterion

**Cadmium** - retained at Morristown and Pine Brook due to method detection limit issues for chronic aquatic life (AQLc) criteria

**Chromium** - delisted at Morristown, retained at Pine Brook due to total recoverable concentrations above dissolved hexavalent chromium (Cr+6) AQL criteria

**Copper** - listed at Morristown and Pine Brook due to total recoverable concentrations above dissolved AQLc criteria

**Lead** - retain at Morristown and Pine Brook due to levels above HH and AQLc criteria

**Mercury** - retained at Morristown and Pine Brook due to MDL issues with AQLc criterion

**Zinc** - delisted at Morristown and Pine Brook due to compliance with SWQS criteria

#### 3. 2002 303(d) List De-Listing Approach for the Whippany Watershed



### **3.1 303d Evaluation Monitoring Data**

A Work/Quality Assurance Project Plan for 303d Evaluation Monitoring was approved (NJDEP, 2001). The 304(l) listing did not specify location; Morristown and Pine Brook were used to evaluate this 304(l) listing. Total recoverable and dissolved metals data were collected at these stations under baseflow conditions using modified Clean Techniques during two sampling runs. Criteria were calculated using hardness at the time of sampling. Data and comparisons to criteria are provided in Appendix 1.

### **3.2 Ambient Stream Monitoring Network Data**

A Quality Assurance Work Plan for the Ambient Stream Monitoring Network was approved for each year. Data collected in the Ambient Stream Monitoring Network since 1996 were evaluated to determine if samples were collected under elevated flow conditions. This network collects only total recoverable (TR) data because about 85% of metals samples collected each year are below minimum detection limits (MDL).

Total recoverable samples collected at Morristown and Pine Brook under elevated flow conditions were compared to applicable TR and dissolved fraction (DF) criteria for human health (HH), acute aquatic life (AQLa) and chronic aquatic life (AQLc). Data and comparisons to criteria are provided in Appendix 2.

### **3.3 2002 303d Recommendations for Whippany Watershed Metals**

Results from the evaluation of the 303d Evaluation Monitoring (baseflow) data and Ambient Stream Monitoring Network (elevated flow) data were used to develop 2002 303d Recommendations for Whippany Watershed Metals which are summarized in Appendix 3.

#### 2002 303d Recommendations List for Whippany Watershed Metals

**Arsenic** - retain at Morristown and Pine Brook due to MDL issues for HH criterion (As HH - 0.017 ug/l as TR; MDL - 1.0 ug/l); conduct low level analyses to address MDL issues.

**Cadmium** - delist at Pine Brook due to compliance with HH and AQL criteria; retain at Morristown due to MDL issues for AQLc criterion (lowest Cd AQLc - 0.93 ug/l as DF; MDL - 1.0 ug/l); conduct low level analyses to address MDL issues.

**Chromium** - delist at Pine Brook due to compliance with HH and AQL criteria

**Copper** - delist the Whippany River at Morristown and Pine Brook due to compliance with AQLa and AQLc criteria

**Lead** - Delist at Morristown due to compliance with HH and AQL criteria. Retain at Pine Brook due to exceedences of AQLc and HH.

**Mercury** - delist the Whippany River at Morristown and Pine Brook due to compliance with HH and AQLa; retain due to MDL issues for AQLc (Hg AQLc: 0.012 ug/l as TR, MDL range: 0.1 ug/l to 0.040 ug/l); conduct low level analyses to address MDL issues for AQLc criterion.

### **4. Statewide Application of the 2002 303(d) List De-Listing Approach for Metals**

The approach developed for the Whippany River can be applied statewide for streams listed on the 1998 303d list for metals. The approach is described briefly below and summarized as a flow chart in Appendix 4.

For each listed reach:

**Step 1:** Compare final 303d Evaluation Data collected under stable baseflow conditions to applicable SWQS criteria. If criteria are met for all samples, proceed to Step 2; if criteria are not met for all samples, retain on the 2002 Impaired Waterbodies List, which will include a management strategy.

**Step 2:** Determine if Ambient Stream Monitoring Network data collected since 1996 were collected under elevated flow conditions. If elevated flow data are available, proceed to Step 3; if data are not available or were not collected under elevated flow, retain on the 2002 Impaired Waterbodies List and collect new data under elevated flow conditions.

**Step 3:** Compare Ambient Stream Monitoring Network data collected since 1996 under elevated flow conditions to applicable SWQS criteria. If criteria are met for all samples, pursue delisting in 2002. If criteria are not met for all samples, retain on the 2002 Impaired Waterbodies List and collect new data under elevated flow conditions.

**Note:** If criteria are below the method detection limit, collect new data under appropriate flow conditions and analyze using low level methods. For hardness dependant criteria, the needed detection limit will vary based on hardness at the time of sampling. The lowest criteria and currently achievable detection limits at the NJDHSS lab are provided in Appendix 5.

NJDEP is exploring the lowest achievable detection limits with the current laboratory (NJDHSS), the USGS-Denver laboratory, used for the Ambient Stream Monitoring Network, or a contract lab. Currently two contract labs have NJDEP certification for low level mercury analyses (MDL 0.001 ug/l). NJDEP is exploring OQA approval to use USGS-Denver Laboratory or, if needed, certification of a contract lab for low level analyses for arsenic, cadmium, copper and lead.

**Note:** Beryllium (Be) and iron (Fe) will be delisted statewide because there are currently no adopted SWQS criteria for these metals.

**Note:** Lead exceedences were the most common in the ASMN database, due in large part to comparison of TR data to DF criteria. Therefore, sites which had ASMN (TR) data above the lead criteria were selected for additional sampling. USEPA Region 2 agreed to sample up to 34 sites for listed metals under elevated flow conditions; samples will be analyzed at the NJDHSS or USGS laboratory. (See Appendix 6).

## **References**

NJDEP, Division of Water Resources. *Assessment of Waters Impaired by Toxic Pollutants - FY90*. Bureau of Water Quality Standards and Analysis. Aug. 1990. Draft.

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NJDEP, Water Monitoring Management. *Work/ Quality Assurance Project Plan 303(d) Evaluation Monitoring. FY2001- Revised.* Nov. 14, 2000.

USEPA, Office of Water. *The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion* (EPA 823-B-96-007) June, 1996.

## **Appendix VI**

### **List of Acronyms and Abbreviations**

AGWQN:	Ambient Ground Water Quality Monitoring Network
AMNET:	Ambient Biological Network
AQLa	Aquatic Life Acute
AQLc	Aquatic Life Chronic
AU:	Assessment unit.
BMP(s)	Best Management Practice(s)
ASMN	Ambient Stream Monitoring Network
BIOS	Biological System, a component of STORET (see STORET)
C1	Category 1
CALM:	Comprehensive Assessment and Listing Methods
CCMP:	Cooperative Coastal Monitoring Program
CEHA:	County Environmental Health Act
CLP	Clean Lakes Program Phase I diagnostic studies
DF	Dissolved fraction
DFW	Division of Fish and Wildlife
DO:	Dissolved Oxygen
DRBC:	Delaware River Basin Commission
DSRT	Division of Science, Research and Technology
DWQS:	Drinking Water Quality Standards
EQUIS	Earthsoft's EQUIS
EWQ	Existing Water Quality (network)
FC:	Fecal Coliform (bacteria)
FW	Fresh Water
FW1	Fresh Water Category 1
FW2	Fresh Water Category 2
GIS:	Geographic Information System
GW:	Groundwater
GWIA:	Groundwater Impact Areas
HEP:	Harbor Estuary Program
HH	Human Health
HUC:	Hydrologic Unit Code
IBI:	Index of Biotic Integrity
IEC	Interstate Environmental Commission (formerly Interstate Sanitation Commission)
LWQA	Lake Water Quality Assessment Reports
CWA	Federal Clean Water Act
MA1CD10	minimum average 1 day flow with a statistical recurrence interval of 10 years
MA7CD10	minimum average 7 day flow with a statistical recurrence interval of 10 years
MA30CD5	minimum average 30 consecutive day flow with a statistical recurrence interval of 5 years
MCL:	Maximum Contaminant Level
MDL	Maximum Detection Limit
MPN:	Most Probable Number (of Fecal Coliform bacteria)
NAWQA:	National Ambient Water Quality Assessment
NJ:	New Jersey

N.J.A.C.:	New Jersey Administrative Code
NJADN:	New Jersey Air Deposition Network
NJDEP:	New Jersey Department of Environmental Protection
NJDHSS:	New Jersey Department of Health and Senior Services
NJIS:	New Jersey Impairment Score
NJPDES	New Jersey Permit Discharge Elimination System
NJLMP	New Jersey Lake Management Program Reports
N.J.S.A.:	New Jersey Statutes Annotated
NO <sub>3</sub> :	Nitrate
NRCS:	National Resource Conservation Service
NSSP:	National Shellfish Sanitation Program
NY:	New York
ODES:	Ocean Data Evaluation System
PAH:	polycyclic aromatic hydrocarbon
PCB:	polychlorinated biphenyl
P.L.:	Public Law (federal)
PPM:	parts per million
PPB:	parts per billion
QUAPP	Quality Assurance Project Plan
RF3:	River Reach File 3
RPB:	Rapid Bioassessment Protocol
SC	Saline coastal
SE	Saline Estuary
SIIA:	Sewage Infrastructure Improvement Act
SRP:	Site Remediation Program
STORET:	<u>Storage and Retrieval</u> , USEPA's water quality database
STP:	Sewage Treatment Plant
SWAP:	Source Water Assessment Program
SWQS:	Surface Water Quality Standards
TCE:	tetrachloroethylene
TIBC:	(Interagency) Toxics in Biota Committee
TMDL:	total maximum daily load
TP	Total Phosphorus or Trout Maintenance
TR	Total Recoverable
TSS	Total Suspended Solids
USEPA:	United States Environmental Protection Agency
USGS:	United States Geological Survey
WATSTORE:	Water Data Storage and Retrieval System, USGS water quality database
WCE:	Water Compliance and Enforcement
WLA:	Waste Load Allocation
WMA:	Watershed Management Area
WQ	Water Quality
VOC:	volatile organic compound
305(b) Report:	Water Quality Inventory Report
303(d) List:	Impaired Waterbodies List